THE

AMERICAN JOURNAL

OF

PHARMACY.

APRIL, 1839.

ORIGINAL COMMUNICATIONS.

ART. I.—ON DELPHINIUM CONSOLIDA.

By Thomas C. Hopkins.

(*An Inaugural Essay.*)

The catalogue of substances, termed vegetable alkaloids, is daily increasing; they are, generally speaking, the principles upon which depends the medicinal activity of the vegetables whence they may be derived; hence, the importance of the labors of the analytic chemist must be apparent to, and appreciated by the physician, as from their results he is enabled to administer a great variety of medicinal agents in an isolated state; thus avoiding the necessity of exhibiting, combined with the active principle, an adventitious bulk of matter, which is not only useless, but, in some cases, very injurious. As a striking proof of the importance of his science, in a medicinal point of view, the organic chemist need only point to the light which his labors have thrown upon the constitution of many agents which are indispensable in medicine, for an instance of which we might mention opium.

But it is not required that, in order to be replete with interest, a newly discovered substance should should be en-

dowed with remedial power; it is enough to ensure it a welcome at the hands of science, that it be possessed of a definite constitution and peculiar properties; of this nature is a vegetable alkaloid discovered by LASSAIGNE and FENEULLE, in the seeds of the *Delphinium stavisagria*, or stavesacre seeds, and called delphia, or delphinia, and the following series of experiments are intended to demonstrate the existence of this principle in a different species of the same genus, the *Delphinium consolida*.

BOTANICAL HISTORY.

The genus Delphinium is found under the class Polyandria, and order Trigynia; it belongs to the natural order Ranunculi of JUSSIEU, or Ranunculaceæ of DECANDOLLE and LINDLEY. The fancied resemblance between its flower and the head of the dolphin, has conferred the generic title. The genus is characterized as follows: calyx none, petals five, nectary bifid and horned, pods one or three. It is divided by botanists into nine species, several of which are indigenous to our own country.

Local names.—Larkspur, larksfoot, stagger weed, rocket larkspur. Larkspur is an annual herbaceous plant, usually attaining the height of ten or twelve inches, though it exceeds this in situations favorable to its growth. It has a fibrous, yellowish root, and an erect branching stem, which is somewhat hairy. The leaves are deeply sinuated, so as to give rise to long, linear segments, which are forked at the top; it is this form of the leaf which has originated the popular name of the plant. The flowers are generally of a sky-blue color, and disposed upon the plant in loose, terminal racemes. The peduncles are longer than the bractes, and the nectaries are one-leaved, having an ascending anterior horn, which is about as long as the corolla. The seeds are borne in smooth pods, are irregularly angular, about one line in diameter, of a brown, or blackish-brown color, and have an embossed appearance, owing to minute hairs upon their surfaces, which, when viewed through the microscope, are found to be collected

into distinct ridges or tufts. This species of Delphinium is a native of Europe, but has been introduced into the United States, in some parts of which it has become naturalized, growing rather abundantly in woodlands, in some of the western states.

PROPERTIES.

All parts of the larkspur possess bitter and nauseating properties. The seeds appear to be the portion in which the greatest share of activity resides. These are of an extremely bitter, acrid, and nauseous taste, and yield readily under the pestle, but are with difficulty reduced to an impalpable state, which seems to be in consequence of their containing a large proportion of fixed oil. Paper strewed over with the bruised seeds, quickly becomes saturated, by imbibing it. The flowers come next in acrimony to the seeds. Spirit imbued with their active principles, constitutes a domestic preparation for destroying lice in the hair, for which purpose it is said to be peculiarly efficient. It is also stated, that animals, after having partaken of the plant, become affected in a peculiar manner, to which affection the name of "staggers" has been applied, by those in whose vicinity the plant grows naturally. The juice of the flowers, by inspissation, yields a blue pigment, which, by the intervention of alum, as a mordant, has been used as a dye It is also stated, that a syrup, colored by this juice, has been criminally vended as syrup of violets.

MEDICAL HISTORY.

The *Delphinium consolida* has been placed in the secondary list of the United States Pharmacopœia, where the root is specified as the officinal portion. This plant, for the most part, has been regarded as presenting but very humble claims to medical observation.

Since all its remedial efficacy is possessed by some other substances, which are at the same time devoid of its objectionable qualities, it has, and no doubt justly, been cast into the shade. Still, like many other substances which have

from time to time uselessly swelled the list of medicinal agents, the larkspur has enjoyed its short period of favor, and the species owes its name to the high repute in which its flowers were held as a vulnerary.

Various parts of the plant have been used medicinally. The flowers were formerly considered diuretic, vermifuge, and emmenagogue, and the seeds, in large doses, are said to produce vomiting and purging. A tincture of the seeds, prepared by macerating an ounce of them in a pint of diluted alcohol, has been employed, both in this country and in England, in spasmodic asthma and dropsy. The dose of this tincture is ten drops. The root is but little, if at all used.

CHEMICAL HISTORY.

No chemical analysis has, as far as I am enabled to ascertain, been made of the plant under consideration, though the seeds of a congener (the staphisagria) have undergone investigation, and it was from a supposition that those of the larkspur partook of an analogous constitution, that the annexed experiments were essayed.

1*st*.—A decoction of the seeds showed a distinct acid reaction, and presented, when filtered, a yellowish-green color. It was of a bitter, nauseous taste, and produced, with the tincture of muriate of iron, a black color, showing the presence of gallic acid. The absence of tannin was shown by their being no change produced by a solution of gelatin. No change in color was produced by tincture of iodine. With a solution of acetate of lead, it afforded a copious flocculent precipitate, of a dirty, white color, which, when collected and dried, presented all the characters of the compound formed by the union of gum and oxide of lead.

2*d*.—A portion of the seeds were submitted to the action of sulphuric ether for the space of twenty-four hours; the ether soon acquired a greenish color, and, on filtration and evaporation, yielded a fixed oil, which was limpid, of a greenish-yellow color, nearly insipid, and of the specific gravity .90; though, as it possessed some odor, it is but fair to

presume that its specific gravity was somewhat effected by the presence of a volatile oil. In consequence of its green tinge, the presence of chlorophylle was inferred. In order to ascertain whether this oil could be as readily obtained by alcohol, as by ether, two ounces of the bruised seeds were digested in eight ounces of absolute alcohol for two days, at the expiration of which, the alcohol was decanted, and evaporated, when about three drachms of an oil remained, having all the characters of that mentioned above, with the exception of being less green.

3*d*.—Two drachms of the bruised seeds were submitted to distillation with six ounces of water. The peculiar odor of the seeds, while decocting, was soon perceived in the recipient, and the distilled liquid acquired a milky appearance. It was suffered to stand a short time, but no globules of oil separating, it was thrown back into the retort upon two drachms of fresh seeds, and the distillation repeated. A result was obtained similar to the first; no globules separated, but the liquid passed over with the milky appearance increased. The experiment was repeated for a third time, the distilled liquid being thrown back upon fresh seeds. Upon distilling into a recipient kept cool, a number of globules were seen floating upon the surface. These were separated by sulphuric ether. Upon carefully evaporating which, a few drops of a limpid essential oil remained behind, which possessed the odor of the seeds in a very concentrated state. Its taste was somewhat nauseous, but was devoid of marked bitterness. Like most other essential oils, it was of a pale straw color, and appeared to be less volatile than oils of the same class; as the oil, when dropped upon paper, required two or three hours for complete evaporation. The seeds from which this oil had been obtained, were found to be as bitter after, as before distillation.

4*th*.—A tincture was prepared by digesting two ounces of the seeds in two pints of alcohol, of 36°, for the space of fourteen days. The menstruum slowly acquired a slight yellowish tinge, possessed, but in a faint degree, the properties

of the seeds, and upon evaporation yielded but little more than a drachm of a reddish-brown extract, almost entirely soluble in water, and having considerable bitterness. This amount of extract was exclusive of fixed oil; for, when the tincture was considerably evaporated, a quantity of fixed oil rose to the surface, and was separated. That portion of the alcoholic extract which could not be dissolved in water, had the appearance of resin.

5th.—A much larger proportion of aqueous, than of spirituous extract, was afforded by the same quantity of seeds, and appeared to be possessed of almost equal bitterness, yet no effect upon the system was experienced by doses of a grain.

6th.—A decoction was prepared, by boiling an ounce of the bruised seeds, in half a pint of water, acidulated with sulphuric acid. The decoction was filtered, and a solution of acetate of lead gradually added, until a precipitate ceased to be thrown down, after which it was again filtered. Through the clear liquid was then passed a stream of hydrosulphuric acid, until sulphuret of lead ceased to be thrown down. The sulphuret was then removed by filtration, and the liquid raised to the boiling point, in order that any excess of hydrosulphuric acid might be expelled. A portion of pure magnesia was then added, and the vessel containing the mixture occasionally agitated. After a time presumed sufficient for chemical action to have taken place, the mixture was filtered, and the filter with its precipitate washed, then dried, and treated with boiling alcohol; it was again filtered, and the alcohol exposed to spontaneous evaporation in a glass capsule. A substance remained in a pulverulent state, around the margin of which, by means of the microscope, a number of minute crystals could be distinguished, the form of which was that of a three-sided pyramid. The greater portion of this substance was not crystallized. By dissolving a small quantity in alcohol, and applying it to litmus paper, which had been colored red by an acid, the blue color was perfectly restored, thus giving a decided proof of its alkaline nature. This substance was of a dirty white color, excessively bitter, and, as

is shown by the mode in which it was obtained, soluble in alcohol, but very sparingly soluble in water. It dissolved readily in acids, forming with the sulphuric and nitric, crystallizable salts. The muriate and acetate of this vegetable alkali could not be made to crystallize. All its salts were deliquescent. When a portion of this substance was placed upon a heated plate, it was melted like wax, and by increasing the heat was consumed without residue. About five grains of it were obtained from an ounce of seeds, which, after decoction, as stated above, with acidulated water, were found to be wholly deprived of their bitterness; whereas, when boiled with water, not acidulated, it was almost impossible to exhaust them, though decocted several times in successive portions of water. I have examined the description of delphia given by its discoverers, and find it to agree in every particular with the above substance, and, therefore, think it not a hasty conclusion to pronounce these two substances identical.

7th.—In the former part of the last mentioned process, when the mixture, after the addition of magnesia, had been filtered, the filtered liquor was found still to possess considerable bitterness. It was, therefore, evaporated somewhat, and then washed with sulphuric ether. Upon decantation, and the evaporation of the ether, a small quantity of a substance was left, having a very bitter taste, and which was supposed, at first, to be a peculiar principle, differing from delphia, as obtained by the last process; but, upon a further investigation, it was found to possess all the properties of that substance. We would consequently infer, that a minute portion of delphia remained dissolved in the liquid, from which the major part had been precipitated by the magnesia, and that this minute portion was abstracted by the ether.

8th.—In order to ascertain whether the stavesacre seeds, similarly treated, would yield similar results as above, one ounce of those seeds was submitted to decoction in acidulated water, and treated in every respect precisely as the larkspur seeds were in the last experiment. By precipitating with magnesia, delphia was obtained, and by washing the filtered

liquor with ether, another, though minute portion, was detected. Some doubt might be entertained as to the nature of the substance obtained by ether, for it is fair to suppose that an acetate of magnesia might exist in the filtered liquid, and that this was what the ether abstracted. But putting aside all other evidence to the contrary, acetate of magnesia was proved, experimentally, to be insoluble in sulphuric ether, and this salt is the only substance, other than delphia, that the liquid could contain.

9th.—A portion of the seeds were incinerated, and the incinerated mass lixiviated with hot water and filtered. To the filtered solution, a small portion of nitric acid was added, and the solution evaporated to dryness, when the readily recognised crystals of nitrate of potassa were left behind.

Upon lixiviating a second portion of the incinerated seeds with dilute nitric acid, filtering, and testing one part of the solution with oxalic acid, and another part with a solution of ferrocyanate of potassa, a copious white precipitate of oxalate of lime was obtained in the first case, and a deep blue color was produced in the second, indicating the presence of iron.

The constitution of larkspur seeds may, therefore, be stated to be as follows:—1st, gum; 2d, gallic acid; 3d, chlorophylle; 4th, fixed oil; 5th, volatile oil; 6th, resin; 7th, delphia; 8th, salts of potassa, lime, and iron.

SELECTED ARTICLES.

ART. II.—ON THE PREPARATION OF THE ESSENTIAL OIL OF MUSTARD.

(*Bertliner Medizinist Zeitung.*)

The essential oil of mustard, from its active medicinal qualities, will soon become a common remedy, and will no doubt be introduced into our pharmacopœia, as it has already been into the Hamburg new dispensatory. This oil belongs to that class of essential oils which do not pre-exist in the substances from which they are obtained, and whose mode of production by the agency of water is not yet satisfactorily explained. It is similar in this respect to the essential oil of bitter almonds, but differs from it in being unaffected by the oxygen of the atmosphere, and in containing sulphur as one of its elements. The statements of chemists, with regard to the preparation of this oil and the quantity obtained, are so various, that the author was induced to make some experiments, as to the best mode of preparation and the quantity to be obtained from a certain amount of black mustard seed.

Messrs. Bertram and Robiquet, (Journal de Pharmacie, Mai, 1831,) obtained from one killogram of powdered mustard, half a gross, or according to our weight, nearly thirty grains from every pound. M. Dann (Buchner's Register) obtained from thirty pounds of mustard seed, eleven drachms, and M. Aschoff,(Jour. per Pract. Chem.) from one pound obtained forty-two grains. It seems that M. Thibierge, introduced the use of this essential oil, but says nothing about the quantity obtained from the raw material.

The result of the author's experiments, prove that the method of distillation commonly used for the preparation of the essential oils, cannot be advantageously employed for the

oil of mustard; but he highly recommends distillation by means of steam, as affording far better results than the old method, in respect to the quantity and purity of the product. On account of its volatility, great care is to be taken in its collection. The apparatus for filtering with the exclusion of the atmosphere is very suitable for the purpose. The average quantity of the essential oil obtained from the pound of powdered mustard seed, was forty-two grains, but there existed a great difference in amount from different parcels of the seed. The author states, that the Dutch seed is preferable to either the German or French.

The oil obtained was of a yellowish color, but the first portions that came over appeared white; its specific gravity at 62° F. was 1.020, different from that given by M. Fontanelle, 1.0387; the oil when exposed to a low temperature appears opalescent, from having dissolved in it a small quantity of water. It dissolves sulphur and phosphorus, and on long exposure to the atmosphere it lets fall a sediment consisting of sulphur; it prevents fermentation.

According to analysis it consists of

Carbon	49.84
Nitrogen	14.41
Hydrogen	5.09
Oxygen	10.18
Sulphur	20.28
	99.80

Properties and method of using the volatile oil of mustard seed.

The volatile oil of mustard seed, after many successful trials, is proved to be an effectual irritating remedy, suited to fulfil the counter-stimulant plan of treatment, and capable of increasing or exalting the vital actions in debilitated or paralyzed organs. It is now kept in all the principal apothecary shops in Germany. On account of its volatility, the greatest care is necessary to preserve it, as even when dilute and kept

in closely stopped vials, excluded from the light and heat, it loses its potency. It possesses so penetrating, and strong a smell of mustard, as to produce a painful sensation in the nose and eyes, with an increase of secretion, and so powerful is it, that when brought in contact with the sound skin, intolerable heat and burning, with intense redness and vesication, are the result. Hence, if used for medicinal purposes, it must be in a most dilute form. For external application, thirty drops may be dissolved in an ounce of spt. vini, or six or eight drops in a drachm of ol. amygdalæ, which solutions have still the characteristic odor and taste. There are two modes of external application. First, one of the above preparations may be rubbed on the skin by means of a piece of flannel or linen dipped in it; this method answers well in general, especially in the cases of children and females, and upon places where the skin is tender and not impaired in sensibility. The solution, thus applied, evaporates in a few minutes, leaving a sensation of burning and redness; parts contiguous to those affected are to be selected, and the application may be repeated after intervals of from four to six hours.

2. Pieces of flannel or linen, moistened with the solution, may be applied and retained in their position, until the active principle evaporates, which occurs generally in eight minutes. This method is suited to patients with a less irritable skin, or in whom the sensibility has been impaired by disease. The burning sensation immediately is experienced, and sometimes becomes intolerable, the patient tearing off the pledgets, under which the skin appears still more reddened and even blistered. In chronic cases it is sufficient to make the application twice a day, but not over the same places, from the excessive irritation.

As the effect of this essential oil upon the human system is so energetic, it is only calculated to be employed as a contra-irritant in diseases without excitement, as in chronic rheumatism, and affections of joints, its attendants, where it presents some advantage over blisters. It will, likewise, prove servicable in neuralgia, odontalgia, paralysis, &c., in which the

inflammatory condition has been subdued by bleeding, general or topical. The following case affords an example of its efficacy.

A female, aged twenty-seven years, had, during the last four years of her life, suffered from neuralgia, originating from the spinal column, in the region of the upper dorsal vertebræ; the paroxysms were extremely violent. The iron had been used, but without effect; and the solution of volatile oil of mustard was applied morning and evening, with decided mitigation of the symptoms, and diminished frequency of the paroxysms.

It has also been employed successfully in colic.

If given internally the proportion is two drops to a six ounce mixture; dose, ℥ss.

ART.—III. STATE OF PHARMACY IN PERSIA.

By M. Julia de Fontenelle.

Medico-chirugical and pharmaceutic knowledge is little advanced in Persia; in serious diseases the Persians still betake themselves to the predictions of astrologers, and to the mystic incantations of their *hakkins*, (doctors.) Believing in the singular doctrines of hot and cold diseases, and in male and female remedies, which they have derived from the works of the Arabians of the twelfth and thirteenth centuries, as, for instance, *Rosa*, *Abenzoar*, *Avicenna*, *Sibusenna*, &c., ignorant, moreover, of the first elements of anatomy, of physiology, and chemistry, they remain stationary, and repel all attempts to instruct them in the true principles of the art. In fact, whoever was seen dissecting would be regarded as impious; and he who would apply himself to chemical researches, would be supposed to be in correspondence with the devil, and would be regarded as a magician. The art of curing is divided, in Persia, into three branches--the

doctors or *hakkins*, the *druggists* or *pharmaciens*, and the *barbers* or *surgeons*. The pharmaciens have small shops in the bazaars, where drugs are exposed for retail, which consist, for the most part, of dried herbs, of plants for fomentations, infusions, and decoctions, and these are the most lucrative articles of the profession; within a few years, they have received, by way of Georgia, small parcels of chemical agents fabricated in Europe, especially at Moscow, such as the *sulphates of iron and copper*, *sulphate of quinia*, *alum*, *borax*, *tartaric acid*, *bitartrate of potassa*, *the carbonates of soda and potassa*. *Calomel* is sometimes found in their shops, which they call *white powder*, but only in the best provided are to be found the antimonial preparations; they likewise possess euphorbium, elaterium, castor oil, senna, rhubarb, gum arabic, and a number of aromatic herbs, which are procured in the mountainous districts.

The only formulary possessed by the pharmaciens, or Persian druggists, which is still in manuscript, is that of *Noureddin Mahomet*, *Abdalla-hakkin*, *Ainel-Melek-Shiragi;* in it are to be found numerous insignificant and useless substances. It has been evidently compiled from Greek, Latin, and Arabian authors. The department in which they possess the most information, is that of poisons, the largest proportion of which appears to belong to the vegetable kingdom, although they know how to employ arsenic, and the deutochloride of mercury. They obtain the latter from Tiflis in Georgia. They are generally the passive agents of their princes, who pay them well for the criminal service of poisoning; in order the better to conceal their proceedings, they unite them with astrological predictions, so that the victim is led to attribute the result to the terrible and extraordinary action of certain unfavorable conjunctions of the stars, which exercise a deadly and destructive influence upon him. The Persian apothecaries preserve the most profound secrecy as to the nature of their poisonous combinations; those only which are known, are arsenious acid, corrosive sublimate, cinnabar, opium, the powder of the diamond

or emery. The last, which they mix with boiled rice, produces, as it is said, a violent dysentery, generally terminating in death. One of their most deadly preparations is composed of the juice of euphorbia, a very venomous insect, and the mucus of the intestines taken from a person who has died of dysentery. According to them, this combination produces either dropsy, an intestinal inflammation, or typhoid fever. The Druses, certain tribes of Libanus, and of different parts of Syria, also regard this mucus as a powerful and energetic poison.

The Persian pharmaciens have in general the worst reputation; crafty and servile, they do not scruple to obey the sanguinary will of their master, even at the sacrifice of their dearest friends. The weights in use are: the *shaf-gran* and *demi shaf-gran*, silver Persian money, worth twenty sous and ten sous, the weight of which is nearly our half drachm. They also employ grains of barley. Their largest measures, are the *oka* and *manu*, which vary in different localities. A most common article in their shops, is the *choub-chini*, or *China root*, which they employ in all diseases as a sovereign specific. When it is administered, the patient keeps his room, closes the door and windows, and prevents the access of the external atmosphere. A strong decoction of *choub-chini* is then administered to him, and he is covered up in clothes until a profuse perspiration is induced.

But the most curious part of their shops, is that devoted to prophylactics. These, in general, are bezoars, or holy stones of Mecca. The *padzecher*, say they, is the king of medicines—it is the most effectual preserver of life: a venomous insect, dare not attack the fortunate being who is possessed of a bezoar; the scorpions avoid it with care, and look, when it has passed them, to see if they retain their tails; the flies avoid it; the serpents never pursue the way that it has passed over; it is useless, say the princes, to try to poison a man who has one of them, for a charm preserves his life. The apothecaries obtain them from Bockara, India, &c., and often at high prices, (from three to four hundred francs.) They apply

them to the bites of scorpions; first drawing them across their chest, warming them by their breath, and steeping them in fresh milk. This application is accompanied with a supplicatory prayer: *Bizinellah, el rahman, el rathecam, la illa en hulla,* (in the name of the all powerful, and all merciful God, there is no other God but God.) Sometimes in these shops are to be found small quantities of sarsaparilla, called by the Persians *sarsa*, and *cascarilla;* sometimes, also, there are brought from Tiflis small quantities of nitrate of silver, which they name, as also do the Arabs, *hayrgehenna,* (infernal stone.) Within a few years, the English have sold to the druggists of Ispahan and Bagdad, small quantities of ipecacuanha and tartar emetic, which is resold at eighteen sous the grain. They also possess a large number of substances capable of producing abortion. They also sell *henna*, to color the feet and hands, and blacken the hair.

The Persian pharmacien or druggist, is always to be found sitting in his shop, his legs crossed, and smoking his hookah. He receives his customers with great politeness, asks if you are in good health, and assures you that your visit has changed his shop into a garden; that your person is in his eyes more precious than all the treasures of Arabia; finally, if you be a doctor, he adds that your science penetrates his drugs and your condescension his heart.*

*We hope to give hereafter to our readers some scientific and economical details upon Persia; two pupils of the school of Pharmacy of Paris, M. Cassan, son of the pharmacien of this name, and M. Charles Safosse, of the department of Orne, having gone to that country. They have promised to correspond with us upon the subjects connected with our studies.

A. C.

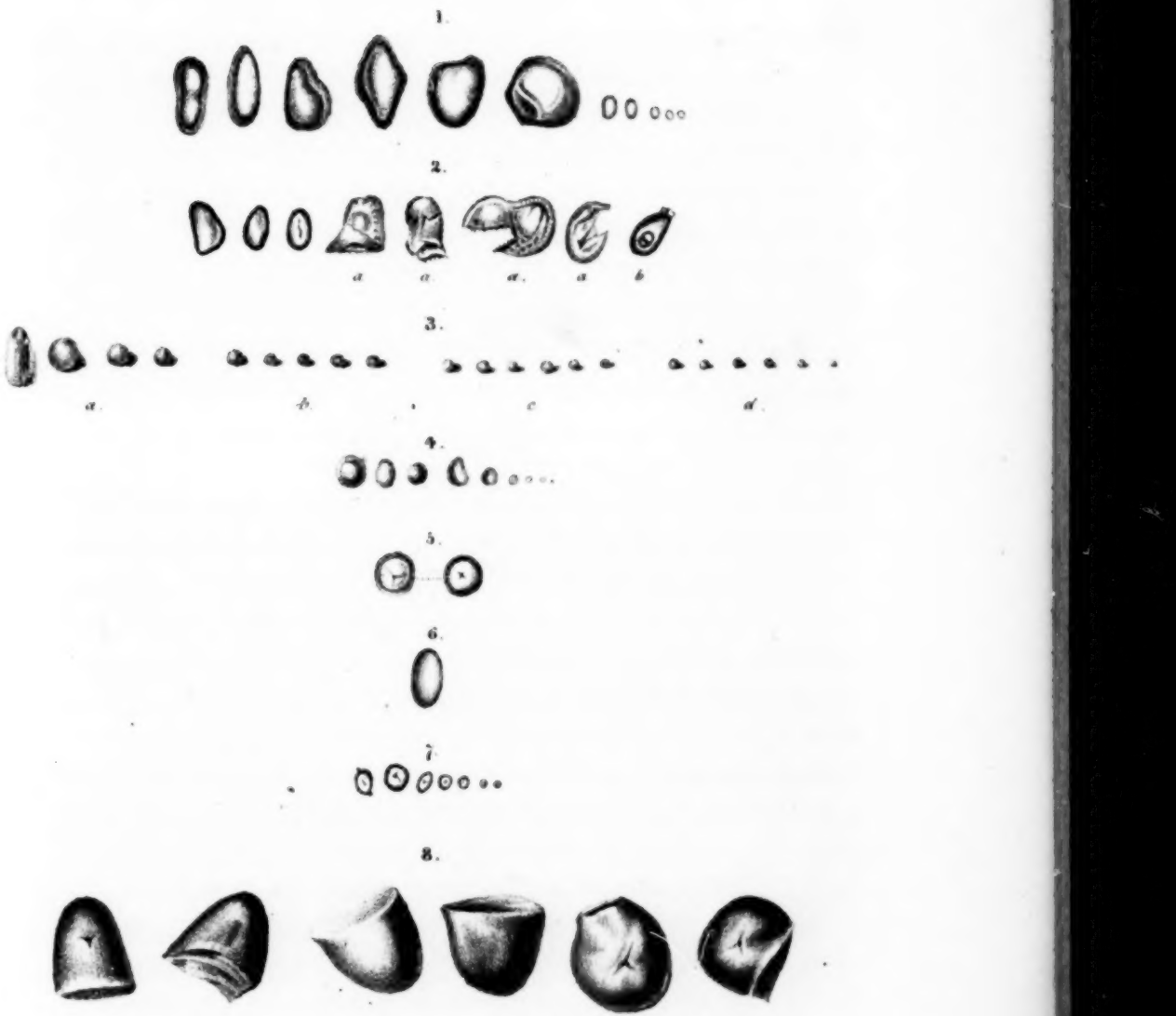
ART. IV.—OBSERVATIONS ON SOME OF THE SPECIES OF FECULA EMPLOYED IN PHARMACY. By F. V. Raspail.

Extracted from his Nouveau Systeme de Chimie Organique.

We have translated from the above mentioned work the researches of Raspail, as regards the microscopic characters of the most prominent feculæ. The difficulty of detecting admixtures of these substances, which are of frequent occurrence, renders it necessary that all the means of discrimination should be familiar to those who are liable to imposition. With the aid of a microscope of moderate power, the size, form, and organization of the grains of fecula can be sufficiently determined, and as these will be found to vary in each species, it affords a method of investigation which may be employed whenever doubts exist of the genuineness of an article. For the information elicited by these researches of Raspail, pharmacy is not a little indebted, as a flood of light has been thrown upon a hitherto obscure department, in which even the most practised are liable to be deceived; and we are certain that by placing it at the command of our readers, benefit will be experienced in their professional transactions.

Potato Fecula.

(*Solanum tuberosum,*) Pl. fig 1. This fecula assumes forms the most varied, and no other known kind possessess dimensions as great. When fresh, there are observed, upon the surface of the grains, concentric rugæ, which often disappear by dessiccation. The largest attain the size of $\frac{1}{8}$ of a millimetre, the remainder vary from the $\frac{1}{10}$ to the $\frac{1}{25}$; they are oval, formed in concentric cocoons, gibbous, obscurely triangular, rounded and spherical, at least those of the smallest dimensions are. The potato is the only plant of which the fecula is used for ordinary culinary preparations; it is that which is of least value. To extract it, the tubercles are washed in water and scraped, they are then rasped, placed upon a sieve, and



1 Potato fecula
2 Sago
3 Granules of Sago
4 Wheat fecula
5 Rye fecula
6 Oat fecula
7 Tapioca
8 Arrow Root

subjected to a stream of water; the marc alone remains upon the sieve; the fecula passes through and is caught in a vessel placed beneath. When the operation is terminated, the water is decanted, the fecula washed, and the water again decanted, and this is repeated until the water can remove nothing more that is soluble. Finally, the fecula is dried in the sun, or by a stove. It then presents itself in the form of an impalpable crystalline powder, having a light bluish tint; under these circumstances it can be affirmed that the grains are the least altered.

Sago Fecula.

(*Obtained from the medulla of certain palms, and in the Molaccas from that of the Cycas circinalis*, L., and *Sago farinaria*, Rumph.) Pl. fig 2. This fecula appears in commerce in the form of globules, which are from four to five millimetres in diameter; their surface is reddish and shining, their consistence hard, so that, before submitting them to examination with the microscope, it is necessary to allow them to remain in cold water for some hours. If fragments of the superfices of these globules are then placed under the microscope, it is evident, that all the grains of fecula are broken, for their integuments, torn and burst open, (*fig.* 2, *a*,) are spread in myriads over the stage. Beneath the superficial layer, the grains, without having been broken, present internally, and sometimes upon a point of their surface, a granular arrangement, a corrugation, *b*, which is to be remarked in all the feculæ that have been momentarily submitted to the action of heat, after having been simply dried or hardened. In the centre of the globules, on the contrary, there are noticed only entire unaltered grains. All these circumstances complete the demonstration of the received opinion, that these globules have been torrefied upon a metallic plate, after having been formed by passing through a sieve, of which the holes, equal in size, are from four to five millimetres in diameter. By manipulating in the same way with the fecula of the potato, provided it be previously scented slightly with an aromatic substance, as

bergamotte, and the torrefaction be not pushed too far, or rather it be not torrefied but glazed, it is possible to make sago which resembles the exotic, and I am led to believe that that of commerce has frequently such an origin. The drug trade, which falsifies every thing, has doubtless not overlooked a falsification so easy.

The grains of this fecula, which have been dilated by heat, attain $\frac{1}{10}$ of a millimetre.

The sago, upon which the preceding observations were made in 1829, was procured from the shop of Bonastre, and at that time was the kind most common in the commerce of Paris.

At a meeting of the Academy of Medicine, Jan. 24th, 1837, M. Planche read an interesting essay upon sago, considered in a pharmaceutic and commercial point of view,* in which he has carefully described the different varieties met with in commerce. The author has had the politeness to present to us four distinct specimens, of which we shall now give the microscopic description.

One of these specimens is labelled *China sago.* It presents all the characters of that which afforded us the type in the first edition of this work. The globules, represented by *fig.* 3, *a*, vary in size from two to four millimetres, when of a round form; such as are oblong attain five millimetres; their surface is tinged of a violet brown, which somewhat penetrates into the interior; they are hard, and require more time than all the other species to soften in water.

The second specimen, of which *fig.* 3, *b*, represents the globules of their natural size, is labelled *Sumatra sago.* The largest of these globules do not exceed two millimetres in diameter. Their color is less deep, and their consistence is tender, and even friable; the molecules separate and dissolve, so to speak, in the water.

The third specimen, entitled *white sago of the Moluccas, fig.* 3, *c*, has the color of ordinary fecula; the largest of its

* See this Journal, Vol. 3, new series, p. 214.

globules do not exceed a millimetre, they are small angulated granulations, analogous to semoulia.*

Finally, the fourth specimen, labelled *rose colored sago*, of the Moluccas, *fig.* 3, *d*, presented the smallest globules; they did not exceed a demi millimetre; some of them were white, others possessed a light rose colored tint.

With the exception of the China sago, all these globules resumed a beautiful whiteness, after remaining an hour in water, and the grains of fecula were disintegrated by the least pressure.

These were the differences which these varieties offered upon simple inspection. I endeavored in vain to discover others with the microscope. In all, the external layer is formed of an aggregation of torn integuments, half empty, and which became entirely so in water, *fig.* 2, *a;* in all, the next layer presented altered grains, which were corrugated, delicate, flattened on one side, but still distended and round, from the contained soluble substance, and therefore refracting strongly the luminous rays, *fig.* 2, *b.* Finally, in the centre of the globule there were noticed entire grains of fecula, but of which the dimensions varied at each observation, and it was supposed that among molecules of such variable size and form, those of the same dimensions did not always chance to come to the centre. Hence it happened, that from a single observation there were established differences of character, with respect to the several varieties, which disappeared upon repeating the observation. The integuments the most dilated did not exceed in the aggregate $\frac{1}{5}$ of a millimetre, and the most entire grains the $\frac{1}{10}$. The general form and aspect were identical, and such as have been established, *fig.* 2. Hence it results, that the fecula which has served to form these varieties of sago, was derived from the same genus of plants; that it has not been subjected to ebullition but to torrefaction; for ebullition would have distended and not have torn the teguments, whilst by torrefaction the teguments of fecula assume the general forms of *fig.* 2, *a.* This fecula has been, while humid, submitted to torrefaction, without which all the

*A kind of vermicelli.

grains would have appeared themselves cracked, but retaining their form and ordinary dimensions, *fig. 2, b;* for in order that an integument shall split in distending, it is necessary that the grain should be plunged in a humid atmosphere, so that the soluble substance shall find a solvent at the favorable instant. Torrefaction could only affect them at the instant they were formed into globules, for its effects are well evinced upon the surface of the spheres, less so immediately beneath, and not at all in the centre. Now when an attempt is made to account for the formation of such globules, it must be admitted that the moist fecula has been pressed in a kind of strainer, that it is moulded by the perforations, and that after having passed through, it falls upon a surface heated at least to 100° R. The size of the globules, for this reason, depends entirely upon the diameter of the perforations. The varieties of sago, therefore, only indicate the difference of the mechanical methods employed.

Wheat Fecula.

(*Triticum sativum*, L.) Pl. fig. 4. The greater number and the largest grains of this fecula do not exceed $\frac{1}{200}$ of a millimetre; they are spherical, and commingled with *patulous* torn integuments, which depend upon the grains of fecula which have been broken by the mill. They are much more shining, rounder, and better preserved, if extracted from the seed when still a little green, and not allowed to dry upon the stalk. It is extracted in the following manner, for the use of linen manufacturers, who prefer it as *starch* for glossing fine linen. The starchmakers place the farina, coarsely powdered, in large vats, without even taking the trouble to separate the bran; they use also coarse meal and damaged wheat. They mix the farina with a certain quantity of water, to which is added a small quantity of *acid water*, the product of a preceding operation. The sugar and gluten contained in the farina speedily react upon each other, to produce, in the first place, *alcohol* and *carbonic acid*, then *acetic acid*, which dissolves the remainder of the gluten. This is what at first was called

acid water, or fat water; it is thick and sticky; it contains, according to Vauquelin, acetic acid, alcohol, acetate of ammonia, phosphate of lime, and gluten. After having washed the deposit by decantation, it is suspended in water, and the whole poured upon a hair sieve placed over a cask. The coarsest bran remains upon the sieve; the finest, with the fecula, passes through, and is deposited in a state of mixture. Agitation with water is again practised; the fecula by its specific weight separates from the bran, which entirely remains upon the surface of the precipitate, and takes the name of *black grounds*, (grosnoir.) Then the first layer is skimmed off, and a second and third by rinsing the upper part of the remaining mass; the residue is agitated with water, and placed upon a silk sieve, more or less fine. Another proportion of bran is then separated, and no more is to be done than to allow the fecula to deposit, and to wash it to render it pure. It is finally dried by moulding the precipitate in wicker baskets, lined loosely with linen cloth, after which it is turned out in a chamber upon a plaster floor; the blocks or casts should be broken by hand. The fragments are exposed to the air for some days, their surfaces are finally scraped, and they are dried completely by the heat of a stove. The lumps of starch then present little canals, which would appear to indicate a coarse state of crystallization, but which arise, in reality, from the action of the water in escaping. The amidon thus obtained is always more tenacious, and less friable than that of the potato, on account of a certain quantity of gum and gluten which these molecules carry with them on precipitating. This method is fitted to the extraction of the fecula from all organs that contain gluten,—barley for example,—but the starch manufacturers generally employ wheat.

Rye Fecula.

(*Secale cereale*, L.) Pl. fi. 5. The largest grains of this fecula attain $\frac{1}{250}$ of a millimetre, but they are distinguished from all other feculæ, by their flatness and the prominence of their margins, resembling disks, and for the most part marked on one

of their faces by a black cross, or three black rays united in the centre of the grain. Yet we have examined several specimens of rye, which were furnished in 1834, by M. Bosson, a pharmacien of Mantes, of which the grains of fecula had not this cross in their interior.

Oat Fecula.

(*Avena sativa*, L.) Pl. fig. 6. The farina of this grain has, to the naked eye, a cottony or downy appearance, in consequence of the presence of an innumerable quantity of hairs covering the grains. When this farina is observed magnified to 100 diameters, by Sellique's microscope, it appears as if there were presented to the vision an unequal mixture, consisting of large grains of fecula deeply shaded and opaque, oblong or ovoid, from the $\frac{1}{14}$ to the $\frac{1}{22}$ of a millimetre, and from $\frac{1}{10}$ to $\frac{1}{14}$, and by the side of, and sometimes adherent to, the surface of these first, small grains about $\frac{1}{200}$ of a millimetre. In the first edition of my work, from not having examined this mixture by a superior power, I in fact took the large opaque grains for grains of fecula, but I have rectified this error by using a power of 350 times. They are, however, glutinous cellules, as large as grains of fecula, and which are so clearly isolated, and appear under such rounded forms, as to resemble isolated grains of fecula. These glutinous cellules allow the fecula that they contain to be colored by iodine, and the transparency of their parieties is such as not to present an obstacle to the display of the blue coloring.

Arrow Root Fecula.

(*Maranta arundinacea*, L.) Pl. fig. 8. "Arrow root," says Berzelius, "being esteemed by some physicians as possessed of strengthening properties, is sold at a high rate, and it becomes of importance to distinguish it with certainty from other species of amidon. According to Guibourt, it is recognised under the microscope, for the grains of arrow root are translucent, and smaller than those of the amidon of the potato, although their form and size are as variable." Fully

congratulating Berzelius upon his new regard for microscopic observations, we cannot avoid deploring the species of complaisance which has led him to record, in the catalogues which he has invested with the authority of his name, observations at least as superficial as those he has borrowed from Guibourt. According to the characters assigned by the latter to the fecula of arrow root, there are in France perhaps an hundred vegetables, the fecula of which may be confounded with this Brazilian substance. What fecula is not translucent? And what fecula is more translucent than that of Solanum? Finally, what fecula, with the exception of that of the seeds of Chara, has not the grain smaller and the size as variable as that of the fecula of the potato? As to forms, how many are there whose forms vary to infinity? But as it unluckily happens, so far from being translucent, the grains of arrow root are more clouded than any that have been observed by us, and present characters that we have not met with in others. They are the following:

The fecula of arrow root examined in mass has a crystalline aspect, but dull; it is harsher to the feel than that of potato, and almost as harsh as wheat starch; it contains lumps which resist compression and crackle between the fingers. Examined in water by the aid of the microscope, it presents groups of five, six, and even ten or a dozen grains, which the most rapid motion and prolonged agitation do not separate, and which float together in the liquid.

But what is most distinct in the physical characters of this fecula, is the circumstance that each of these grains represents a half, a fourth, or a third, &c., of a solid sphere, some of them being small cylinders, with one extremity rounded like a cap, and the other flattened; while others exactly resemble a paint mullar; hence, each of these grains has always one or more angular surfaces, the refraction of which produces shadows so strong and so various, observed upon the contour of the microscopic image, that it would be supposed there were crystals presented to the eye. This structure is of such a nature, that a written description is better adapted to give an idea of it than the most exact figure. In addition, there are

perceived through their translucent surface, black lines, sometimes crossing each other like the letter T, at others in the form of stars, as in the fecula of rye; and by turning over the grains by a movement communicated to the liquid, these characters are determined not only not to be superficial, but on the contrary to exist in the very interior of the grain, which indicates an internal cellular arrangement analogous to that observed in the lentil;* the largest grains do not exceed $\frac{1}{2\,5}$ of a millimetre. From the tenacious adherence of a great number of these grains to each other, and the angulated surfaces that they have contracted by agglutination, at the same time that they have preserved one of their surfaces spheroid, we are led to conclude that this fecula, composed of rounded grains, and a little soft, has been treated immediately after extraction by the heat of a stove, which heat has been somewhat elevated. I am confirmed in this opinion by the fact, that by ebullition sufficiently prolonged to distend the integuments of potato fecula until they have acquired twenty or thirty times their original diameter, the integuments of the fecula of arrow root attain scarcely four times the volume of the entire grain; which explains why Pfaff has found that ten grains of arrow root boiled in an ounce of water afforded only a mucilaginous liquid, whilst the same quantity of ordinary fecula, with the same quantity of water, afforded a gelatinous mass, a true *starch*.

Fecula of Tapioca.

(*Jatropha manihot*, L.) Pl. fig. 7. The grains of fecula of this root do not exceed $\frac{1}{3\,5}$ of a millimetre. They assume the rounded form, and present in their centre a black point which arises from the play of light due to some circumstance in their internal structure, or to a depression upon their surface. There are two species of tapioca; that from the *sweet manioc*, and that from the *bitter*. It is from the root of the former

*The fecula of the lentil (*Ervum lens*, L.) presents each grain divided into three or four compartments, by black curved lines, which indicate the presence of as many internal cells.

that in America an abundant fecula is extracted, by the ordinary methods, and is known in the colonies by the names of *cipipa* and *moussache.** The laundresses make use of it to whiten linen, although they prefer for this purpose the fecula of the arrow root, which they improperly name *sagou.* Arrow root, in fact, should furnish a less sticky starch.

The pulp of the root which remains upon the strainer, is dried and slightly torrefied; it is reduced to coarse meal, and sold under the name of coucousse, or tapioca; when boiled with milk, it forms an aliment as nutritive as agreeable.

The cassava or cassava bread, is a nutritious preparation, likewise derived from the root of the tapioca plant. When it attains the size of the arm it is washed; the pulpy matter is pressed out into sacks several times doubled, and then spread in layers one or two inches in thickness on iron plates, where, by baking, it assumes the form of cakes, which are dried in the sun upon the roofs of the negro huts.

The juice of the *bitter manioc* contains a poisonous principle, which appears to be a mixture of hydrocyanic acid.

Barley Fecula.

(*Hordeum vulgare*, L.) The grains of this fecula, which do not exceed $\frac{1}{40}$ of a millimetre, have the aspect and form of wheat fecula. The starch makers, submit this grain to the same processes as the last mentioned, to obtain starch.

Fecula of Corn.

(*Zea mais*, L.) Nearly all the grains of this fecula are injured by the mill, in consequence of great adhesion produced in drying by the oil, gum, and sugar contained in the perisperm of this cereal product. The greater number remain agglutinated together, and present the aspect of a cellular tissue with small meshes: all are puckered or more or less wrinkled, and more or less irregularly rounded; the largest scarcely exceed the $\frac{1}{40}$ of a millimetre, and these are

*In the French Islands of the West Indies.

not the most numerous. But if, instead of examining the fecula in the form of ground meal, it be examined as procured from the young grain, and at a period when the perisperm is still milky, the grains present another aspect; they are perfectly spherical, shining and entire, so that the proportions being preserved, it appears to me evident that more fecula would be obtained by expression of the seeds, taken a little in advance of maturity, than by grinding the dried seeds. For the entire and unbroken grains fall to the bottom of the liquid by the first method; whilst by the second, from being altered, broken, and torn by the mill, they yield their soluble substances to water, and remain suspended in the liquid, with the levity of simple integuments. This is the reason that Parmentier, who has employed the second method to analyze maize, obtained so little fecula from its farina, (*Mem. sur le mais*, Bordeaux, 1785.)

Fecula of the Orchis. Salep.

(*Orchis morio, mascula, pyramidalis, latifolia, conopsea, malculata*, L., *besides other indigenous species of Orchis.*) For more than twenty-four years, the French authors upon the Materia Medica have recommended indigenous salep as an excellent succedaneum for Asiatic salep. It is obtained by washing the tubercles of the Orchis in fresh water, stringing them like beads, and boiling them from twenty to thirty minutes; that is, until they commence to be reduced to mucilage; they are then withdrawn from the water, and dried in the sun, or by a stove. Within a short time, a discussion arose among the members of the section of Pharmacy of the School of Medicine; Vauquelin asserting that the tubercles of the Orchis contain an abundance of fecula; while Robiquet, on the contrary, declared that he could not find even traces of it; and since it is impossible to mistake the characters of the fecula in mass, and as both authorities are equally remarkable for the spirit of exactitude with which they proceed in all their researches, we are naturally led to conclude that the same organ might contain fecula, or in the same species be

entirely destitute of it. The following is the explanation of the anomaly:

The stem of the Orchis proceeds from a tubercle, by which it is nourished, and which is consequently exhausted daily. But in proportion as the stem rises, there is produced in the midst of many simple radicles, a new tubercle, which enlarges gradually, and survives the stem, as well as the original tubercle, in order to propagate the species. If it so happens that a chemist looks for fecula in the withered tubercle, he will certainly not find it; and it is probable that this was the case with Robiquet; but this same tubercle contained it before being exhausted by the nourishment afforded to the stem. If the new tubercle, when too young, be examined, again it will not be found. Hence it is necessary to collect the tubercles of the Orchis immediately after the flowers begin to fade; at which period the new tubercle is most rich in fecula and aroma.

The grains of the fecula of the Orchis, examined after having in the form of salep been reduced by ebullition, appear spherical, and do not exceed (the largest at least) the $\frac{1}{100}$ of a millimetre; in some species they are even the $\frac{1}{200}$.

Table of the greatest dimensions of the grains of feculæ enumerated.

Names of Plants.	Organs.	Dimensions.
Solanum tuberosum, Potato.	Tubercles,	$\frac{1}{8}$
Cycas circinalis, Sago.	Medulla,	$\frac{1}{150}$
Avena sativa, Oat,	Seeds, Perisperm,	$\frac{1}{14}$ to $\frac{1}{33}$
Triticum sativum, Wheat,	do. do.	$\frac{1}{20}$
Secale cereale, Rye,	do. do.	$\frac{1}{250}$
Maranta arundenacea, Arrow root.	Root,	$\frac{1}{25}$

Names of Plants.	Organs.	Dimensions.
Jatropha manihot, Tapioca.	Root,	$\frac{1}{3\,3}$
Hordeum vulgare, Barley,	Seed, Perisperm,	$\frac{1}{4\,0}$
Zea mais, Maize,	do. do.	$\frac{1}{4\,0}$
Orchis latifolia, Salep.	Tubercles.	$\frac{1}{3\,0}$

ART. V.—ON THE DIFFERENT COLORING MATTERS OF LEAVES AND FRUITS.—By Berzelius.

1. *The yellow color of leaves in Autumn.*

The change which takes place in the green foliage of trees previous to its fall, after an exposure to some nights of frost, is well known to be from a green to a fine orange yellow. This is observed especially in the *Betula alba*, the *Pyrus malus*, the *Ulmus campestris*, the *Fraxinus excelsior*, &c. The foliage of the *Betula alnus*, on the contrary, rarely becomes yellow, but falls while yet green; that of the oak does not become yellow, but brown. The foliage that has become yellow, sooner or later assumes this brown color, when it becomes dried after its fall. Different researches have been already made upon the yellow color of foliage. Macaire Prinsep has published the results of several experiments upon the autumnal color of leaves—his conclusion is, that the foliage in autumn ceases to disengage oxygen, but that it absorbs this gas from the air; there is then formed an acid which colors the foliage at first yellow and afterwards of a red color, and, that by neutralizing this acid by means of an alkali, the green color of the leaves may be restored; he considers these colors, as Clamort Marquart does, to be modifications of one and the same coloring matter, which he calls *chromule*. He states that this is the cause of the ordinary yellow or red

color of the petals of flowers. These results are by no means exact; the yellow foliage does not become again green by the action of any reagent; but the leaves having become red, recover their green color by means of potassa, because the red coloring matter forms green combinations with that alkali. Leopold Gmelin first directed attention to the inexactitude of the results of Macaire Prinsep. Inspired by this observation, I engaged in some researches upon the color of foliage altered by the influence of the cold of autumn. I have experimented especially upon the citron-yellow foliage of the *Pyrus communis*, which was placed, while yet fresh and immediately upon being gathered, in a flask, and completely covered with alcohol of 0.833, in contact with which it was left for forty-eight hours. The alcohol became of a yellow color, but the foliage still remained yellow, but paler than before; the alcohol was decanted, and the flask placed in an inverted position for some time; the foliage then became of a brown color throughout, wherever it was touched by the air, but in those parts in contact with the sides of the vessel the yellow color was preserved. Alcohol was poured upon the leaves several times, and each time it became of a yellow color; finally, the alcohol was boiled; it again took a yellow tinge, but became gelatinous on cooling.

The macerating liquors were distilled to one-eighth; there was then deposited, upon cooling, a granulent matter, which presented some appearance of crystallization. After the separation of this substance, the distillation was continued, until there remained nothing but the water of vegetation of the leaves. On the top of this yellow liquid, there floated a yellow, soft, fatty substance, which appeared to be identical with the granules which contained the coloring matter of the foliage. These granules did not exhibit, under the microscope, any indications of crystallization, but could be spread out by the fingers into a greasy yellow spot; it was mixed with a fatty oil, which I could distinguish, but could not separate completely, and another substance likewise fatty. It could be partly purified from the former, by digestion with a weak solution

of caustic potassa, which saponifies the oil, but dissolves only a small quantity of the fatty substance; the yellow fatty acids are precipitated from the alkaline solution by the hydrochloric acid, and we may by dissolving them in the caustic solution, much diluted, (5 or 6 drops to the ounce of water,) and precipitating anew, obtain them free from color. To deprive it of the latter substance, or the solid fatty matter, we must treat it with cold alcohol, in which it is not soluble. I have never as yet been able to obtain it perfectly free from these two fatty bodies. Such as I have obtained it, it has the appearance of a yellow fat, easily fusible, becoming liquid even at 42°; when it becomes solid, it is transparent and of a yellowish brown; it is volatile without decomposition, but gives on dry distillation a rather brownish fat, but little soluble in alcohol, and leaves a residue of carbon. It is insoluble in water, but if, when melted, we pour upon it some hot water, it becomes transparent, swells up slightly, and becomes of a paler yellow, as if the water had combined with it chemically. When moistened with water, and exposed a long time to the air and light, it bleaches completely, and is converted into a fatty matter soluble with difficulty in alcohol, and precipitates in light white flocculi from a boiling saturated solution in alcohol. The yellow fat is soluble in alcohol in very small quantity. In this solution it does not bleach sensibly in the same period of time in which it becomes white in water. The alcoholic solution is precipitated by water, and then assumes a pale yellow milky aspect, which it retains even after the evaporation of the alcohol. It is deposited from the alcoholic solution during its spontaneous evaporation in the form of crystalline granules. Ether dissolves it largely, and leaves it, after evaporation, of a yellow color and transparent. In contact with concentrated sulphuric acid, it becomes brown, is dissolved sparingly, but with alteration, and gives a yellowish-brown liquid, which is precipitated by water, of a grayish-white color. It dissolves, but in very small quantity, in caustic potassa, and when thus dissolved, if it be exposed for some time to the influence of the air and light, it bleaches. It is precipitated

from its solution in potassa by the acids, in pale yellow flocculi, which, when properly washed, do not redden litmus paper. It is but little, if at all, soluble in carbonate of potassa, and insoluble in caustic ammonia, to which, however, it communicates a yellow color.

This coloring matter is then a peculiar fatty matter, intermediate between the fatty oils and the resins, which may be whitened without loosing its properties, of difficult solubility in alcohol, and of being fatty and oily. We may name it *zanthophylle* (from ξανθος yellow, and φυλλον a leaf.) We have every reason to presume that in the disappearance of the green color and its change into yellow, this is produced from the green by means of a change of organization of the leaf, effected by the cold, and which modifies the organic operations. But it was in vain that I endeavored to reproduce the green color by means of the yellow; besides, I could not succeed in changing the green to yellow. The brown color of the foliage has nothing in common with the yellow. It is produced by an extractive principle, before colorless, which, after the disorganization of the epidermis of the leaf, becomes brown by the action of the oxygen of the air; it then communicates to the fibres of the skeleton of the leaves a brown color which cannot be taken away even by digestion in a weak solution of caustic potassa, or which the long continued action of sulphuretted hydrogen cannot destroy.

2. *Red coloring matter of fruits.*

The red color of many species of fruits has, in general, been considered as a blue color reddened by an acid; this may be the case in many instances, but it is not so in all; and consequently, the coloring matter of those which are exceptions should be separately determined. I have examined the color of the cherry, (*Prunus cerasus,*) and of the currant, (*Ribes nigrum;*) both contain the same coloring matter, and this is not a blue. The presumption that it was this latter color may have arisen from the fact that the juice of these fruits gives a blue precipitate with acetate of lead; but these precipitates are the malate and citrate of lead, with which the coloring mat-

ter is combined, and from which it may be withdrawn, slightly mixed with a free acid, by the use of sulphuretted hydrogen, and after the separation the acids act with it as I am about to describe. To obtain it pure, the acids must be completely separated; the best agent for this, is chalk in fine powder, which gives rise to a deposit of the malate and citrate of lime. Lime is then to be added in small quantities, to precipitate the neutral malate of lime contained in the liquid. The liquid is to be filtered, and mixed with a small quantity of acetate of lead; the bluish-green precipitate which is thereon formed, is to be separated, because it may contain some malate of lead, and the acetate of lead again added as long as any precipitate is produced. The green precipitate is to be collected on a filter and washed with water, after such a manner that it shall be always covered and protected against the least access of air. It is then to be decomposed by sulphuretted hydrogen, and the filtered liquor evaporated to dryness in a vacuum, by the aid of sulphuric acid; the coloring matter which remains is to be dissolved in anhydrous alcohol, which leaves behind the coloring matter altered by the air, and the pectine or pectic acid. By distilling off the alcohol, and drying the residuum in a vacuum, the coloring matter is obtained as a beautiful red, transparent and brilliant mass. A great loss is sustained if we obtain in the beginning, by means of the acetate of lead, the blue precipitate of the malate or citrate of lead, then precipitate from the filtered liquor the coloring matter by subacetate of lead, and decompose the washed precipitate by sulphuretted hydrogen. In this state the coloring matter is soluble in every proportion in water and alcohol, but is insoluble in ether. It remains after the evaporation of the aqueous solution on a salt water bath; but it is under the form of a deposit less soluble in water, and but little so in alcohol; it is another coloring matter of a reddish-brown and less alterable; if we add to an aqueous solution of the coloring matter, a small quantity of lime water, it precipitates of a greenish-gray. The coloring matter not yet precipitated is red, but of another shade, for it contains a combination of lime

with an excess of the coloring matter. If the natural color were blue, the solution should then become blue, and not red, because all the free acid is saturated. The coloring matter, on the contrary, as we have seen, forms with the malate or citrate of lead a combination which is of a beautiful clear blue; but this color does not exhibit any of the peculiar shade of the coloring matter; dissolved in alcohol, it may be preserved without oxidation. It does not oxidate, however long it may be kept in contact with the free acids in the juice of the fruit. The brownish-red deposit is slightly soluble in water; its solution is of a deep red, but potassa forms with it a deep brown solution. It forms with ammonia a neutral soluble combination, and an insoluble, or but slightly soluble acid, of a reddish-brown color. The neutral green combinations of the pure red coloring matter change, while in a moist state, under the action of the air, into this brown combination. The precipitate by lead is, however, an exception, since it is permanent, both during washing and drying. I have kept, without alteration, for six years, the green precipitate obtained from the bird's service, (*Sorbus acuparia*,) by means of acetate of lead, the malic acid having been previously separated by carbonate of lead.

3. *The red coloring matter of leaves in Autumn.*

We perceive, in the autumn, the leaves of certain trees to become red. All trees and bushes upon which I have seen these red leaves, bear red fruit: (*ex. Sorbus acuparia; Prunus cerasus; Ribes grossularia*, var. *rubra; Berberis vulgaris*, &c.) The red color which they contain is so much allied to the preceding, that they may be considered as identical. However, I have only examined the foliage of the cherry, and especially the red currant. The leaves of this latter becomes ofttimes so red as to have the appearance of the ripe fruit. The coloring matter was extracted by alcohol, which, after distillation, left a red liquor, from which, by filtration, a resin and a fatty precipitate were separated. The filtered liquor was mixed with water, without being troubled,

and then with the neutral acetate of lead; there was formed a precipitate of a fine grass-green, which became, in a few moments, of a brownish-gray; the acetate of lead was added as long as the precipitate changed color, and until the last portions retained their green hue. It was then filtered; that which remained on the filter was a combination of the oxide of lead with the vegetable acids of the leaves, and with a brown coloring matter formed by the action of the air upon the red solutions, both aqueous and alcoholic. The remaining coloring matter was precipitated of a fine grass-green, by the acetate of lead, collected upon a filter, well washed, decomposed by sulphuretted hydrogen, and evaporated to dryness in vacuo. The solution, precipitated by the acetate of lead, still yielded a small quantity of a yellowish-green precipitate when the free acetic acid was saturated by subacetate of lead; from this precipitate the same coloring matter could be obtained as from the former.

This coloring matter, which we may call *erythophylle*, (from ερυθρος, red, and φυλλον, leaf,) if not exactly the same as that of fruits, is, in appearance and chemical properties, similar to that of the cherry and black currant. It differs but a shade in its color, which is a little deeper, and bordering on blood-red, and in the property which it has of forming green or yellow combinations, while those of the coloring matter of the cherry and grape are green or blue. The deposit which is formed on evaporating its solutions, is a brownish-red, more clear than the former, and gives, with bases, brownish-red combinations, which do not, in the air, so easily become of a deeper tint, like that of the fruits; but do these tints belong to the deposit of the coloring matter of the leaves, or rather are they peculiar to the red currant? This I have not examined, and do not know. The red coloring matter of leaves, half precipitated by lime water, yields a green precipitate, while the liquid assumes a paler red; thus the coloring matter is not originally blue.

Journ. de Pharmacie.

ART. VI.—POISONOUS PROPERTIES AND USE OF TANGHIN.

Du Petit Thouars is the first who, in his *Genera Madagascariensia*, has spoken of this plant, which he designates by the name *Thanghinia veneniflua*. More recently Mr. Hooker, profiting by his relations with Mr. Boyer, of the island of Mauritius, has published a complete description of it in the *Botanical Magazine*, accompanied with a plate, under the name of *Cerbere tanghin*. The following is a subsequent description given by M.M. Boyer and Hilsenbey. This tree, say they, attains thirty feet in height, and produces a whitish gelatinous juice; its leaves are lanceolate, entire, similar to those of the *Nerium oleander*, or the periwinkle of Madagascar, *Vinca arborea;* the flower is of the same color, and nearly resembles that of the two plants mentioned, which belong to the family Apocyneæ. The fruit is a *drupe*, opening at maturity; it has the form and size of a lemon; the surface is shining, yellow, and streaked here and there with red; in the centre is found a stone like that of the peach. This fruit undergoes a change from age; it becomes red and poisonous in the centre at the period of maturity, which is distinguished by its withering, and becoming wrinkled upon the surface. It is in this state that it is employed to prepare the drink which plays so conspicuous a part in the annals of the judiciary of Madagascar. In some places, the condemnation of criminals depends upon the circumstance of their living or dying after drinking the *tanghena*. If the dose produces death, the individual was culpable; if he survives, his innocence is evident. At Emerina, where Mr. Hooker has resided, this poison is only administered in a very small dose; it then acts as an emetic. The accused, after having eaten a sufficient quantity of boiled rice, swallows, without chewing, three pieces of the skin of a fowl as large as a crown piece. Then is administered the test draught, composed of a small quantity of the pulverized root

of tanghin in the juice of banana. The *panazon doha* (he who pronounces the imprecation,) places his hand upon the head of the accused, and pronounces the formula of imprecation, invoking all kinds of evil upon him if he be culpable. Shortly after, a large quantity of rice-water is administered; the necessary effect is vomiting; and if, upon examination, the three pieces of skin are found, all is well, the individual is legally acquitted; but if it be otherwise, *the crime has produced its stain*, which to him is irreparable. When the accusation is serious, the potion is so concentrated that the arraigned person often loses his life.

The tanghin must be a very active poison, since it produces its effects even after the stomach is filled with aliment, and the administration of a large quantity of rice-water.

J. DE F.

Journ. de Chimie Med.

ART. VII.—ON THE REACTION BETWEEN QUINIA AND AN AQUEOUS SOLUTION OF CHLORINE AND CAUSTC AMMONIA. By RUDOLPH BRANDES.

IT is some years since the remarkable reaction between quinia and chlorine with ammonia has been made known. This reaction consists in the coloring of the solution of a very intense emerald green. But the production of this color depends upon certain proportions of these substances being used. I attempted to determine these proportions, and have arrived at the following results:—Half of a grain of sulphate of quinia in an ounce of water, on being mixed with 16 to 20 drops of an aqueous solution of chlorine, and then 16 to 20 drops of an aqueous solution of ammonia added, gave a green flocculent precipitate. Half a grain of sulphate of quinia in an ounce of water, mixed with 60 to 100 drops of the solution of chlorine and 10 drops of ammonia gave, also a solution of a very in-

tense emerald green, but without the least trace of a precipitate; a larger quantity of the ammonia had no effect upon the color; but a great increase of the chlorine destroyed it to such an extent that the solution of sulphate of quinia with 100 drops of the chlorine appeared of a greenish yellow; on the addition of ammonia, and with 400 drops of chlorine, it became of the yellow color of white wine; when the colored liquid was saturated with sulphuric acid, the color disappeared, but was again restored by saturating the free acid by means of ammonia.

The solution of chlorine causes a decomposition of the quinia, and this decomposition varies in degree according to the quantity of chlorine, whether we obtain a green precipitate, a green solution, or a yellow solution by an increase in the quantity of the chlorine. The most intense color is produced by using 1 grain of sulphate of quinine, 100 grains of water, 200 drops of the aqueous solution of chlorine recently prepared, and 10 or 20 drops of the solution of ammonia. This color is so intense that we can dilute the solution with twenty thousand parts of water, and it will still retain an appreciable green tint.

The green precipitate is solid, and has the following properties. A green color, an obscurely bitter taste, similar to that of quinia; heated by itself, it fuses, and gives off pyro-ammoniacal vapors; it is insoluble in cold water, and almost insoluble in boiling water; it is fusible, and does not appear to contain any chlorine; it is insoluble in ether, but very soluble in alcohol, and diluted sulphuric, nitric, hydrochloric, and acetic acids. The solutions in these acids were not green but red, similar to red wine, and on being saturated with ammonia, the precipitate was again separated with its original green color. Heated with nitric acid, the green precipitate was changed into a yellow bitter substance.

On evaporating the green ammoniacal solution of quinia, it became by degrees of a red color, and left a reddish residue, mixed with much ammoniacal salt. By treating this residue repeatedly with alcohol, and by repeated evaporation and re-

solution to separate the hydrochlorate of ammonia, there remained a brownish-red substance, of a bitter taste similar to quinia, very soluble in water and alcohol, insoluble in ether and fusible, like the green precipitate, by heat. The aqueous solution of this red matter is precipitated by the subacetate of lead, by the chloride of tin, but not by the salts of iron; this matter does not possess the characters of quinquina red.

From the preceding statements it will be perceived that quinia is decomposed by an aqueous solution of chlorine, at ordinary temperatures; by treating the solution of decomposed quinia with ammonia, different substances are obtained, viz:

1. A green substance, insoluble in water.
2. A red substance, soluble in water.
3. A brown substance, soluble in water.
4. Finally, a green substance, soluble in water, but which we are unable to isolate, because it becomes changed by evaporation of the solutions, into the red and brown substances.

In the interesting memoir of M. Pelletier, upon the action of chlorine upon the vegetable bases, this celebrated chemist comes to different results; but M. Pelletier caused the chlorine gas to act upon the quinia, and thus the results were not similar, a difference which I have also perceived. The reaction of chlorine in aqueous solution, at common temperatures, gives rise to several bodies of a determinate composition, as I think, and elementary analysis only, can elucidate the mode in which these different matters are formed.

Journ. de Pharm.

ART. VIII.—DESCRIPTION OF A NEW MODE OF CHEMICAL ANALYSIS. By M. Ebelman.

No one has as yet endeavored to ascertain directly, in analysis, the quantity of oxygen which many metallic compounds absorb, while dissolving in the oxidating acid usually employed, such as the nitric or nitromuriatic acids. This is owing to the difficulty experienced in estimating exactly, the oxidating value of the acid used, and likewise the variable composition of the gas which is disengaged during the reaction. If it is known beforehand, what quantity of oxygen the solvent used will yield, and if we ascertain the quantity disengaged, it is evident, that the difference will be the exact proportion which has been absorbed by the metallic compound during solution. The process which I am about to describe, appears to me to fulfil these two conditions.

It is known that the hydrochloric acid in dissolving the oxide of manganese disengages one equivalent of chlorine for every equivalent of oxygen which the oxide will yield in passing to the state of protoxide. It is also known that this mixture will act upon the same metallic compounds, as the aqua regia with an excess of hydrochloric acid. If, then, we mix the body to be analysed with a determinate weight of oxide of manganese, of which the composition is previously known, treat the mixture with pure hydrochloric acid, ascertain the quantity of chlorine disengaged, and deduct it from that which the oxide of manganese should itself yield, the difference will be the quantity absorbed, and consequently its equivalent in oxygen.

The estimation of the quantity of chlorine disengaged, may be made by the different methods already employed in the analysis of manganesian minerals. Thus the chlorine gas may be collected, or, what is better, may be caused to react upon an aqueous solution of ammonia, and the resulting nitrogen gas measured, which will be one-third of the volume of the chlorine produced. But the use of pneumatic methods are

not without difficulty, and always require a series of corrections for temperature, pressure, and the hygrometric condition of the gas. It appears to me to be preferable to receive the chlorine in a clear solution of sulphurous acid, mixed with muriate of baryta. The sulphate of baryta, which is the result of the reaction of the chlorine upon the solution, will serve to designate the corresponding quantity of oxygen.

The operation is to be performed in the following manner: The substance under examination is to be powdered very fine, especially if it be attacked with difficulty, and mixed with a known weight of oxide of manganese. The quantity of oxygen likely to be absorbed, may be nearly estimated beforehand, and by doubling the quantity of manganese which may be supposed sufficient to furnish the necessary oxygen, we may be satisfied that we will obtain a complete solution of the metallic matter. The operation is to be conducted in nearly the same manner as the analysis of the minerals of manganese themselves, only it is proper to carry on the process more slowly, so that time may be allowed for the brown solution of manganese to act upon the substance to be analysed. When the solution is finished, and all the chlorine has passed into the vessel containing the liquid sulphurous acid, an excess of muriate of baryta is to be added, and the excess of sulphurous acid driven off by boiling; the sulphate of baryta precipitated is then to be separated by a filter, calcined and weighed.

One atom of sulphate of baryta,	1458.09 is equivalent
To one atom of oxygen,	100.
And to two atoms of chlorine,	442.64

We should know, in advance, the quantity of sulphate of baryta which the oxide of manganese should produce by itself; the difference will correspond to the quantity of chlorine, and to the quantity of oxygen remaining in the metallic solution.

One gramme of pure peroxide of manganese loses 0.18 of oxygen when reduced to protoxide; it will consequently produce 2 gr. 62 of sulphate of baryta.

This process, of which the results appear to me to be very exact, seems susceptible of very numerous applications in analytic chemistry. I would point out particularly the following:

1. In treating by the method pointed out, a known weight of a metal, slightly, or not at all acted upon by hydrochloric acid, we ascertain at once the composition of the chloride formed, or of the oxide remaining in solution in the excess of the hydrochloric acid. In certain cases, it is very difficult to determine this composition by the means hitherto employed. In fact, it often happens that we cannot obtain the chloride in a constant state of composition, either from its volatility, or on account of a commencement of a decomposition produced by the heat. It is the same of certain oxides which we cannot obtain perfectly pure. I would quote, for example, the perchlorides of gold and platinum, the composition of which, I think, it will be very easy to verify by aid of the process pointed out.

2. Likewise in certain cases where it is not possible to take the exact weight of the substance to be peroxidized, whilst the quantity of oxide produced may be ascertained with precision. All the products of the oxidation of phosphorus, below phosphoric acid, may be analyzed in this manner, by ascertaining the quantity of phosphoric acid produced during the reaction, and the oxygen required to produce the change.* The body which serves to determine the quantity of oxygen, weighs fourteen and one-half times as much as the oxygen, which lessens very much the chances of error.

3. We may determine the relative proportion of two oxides of iron, by mixing them with an excess of the peroxide of manganese, and treating the mixture by hydrochloric acid.

* To analyze phosphatic acid, M. Dulong measured the quantity of chlorine absorbed by an indeterminate quantity of this acid during its change to phosphoric acid, and then weighed the phosphoric acid formed. This process presents considerable analogy with that which I have described.

This process is as simple as that which consists in treating the hydrochloric solution of the two oxides by sulphurous acid, and ascertaining by the aid of the muriate of baryta, the quantity of sulphuric acid which results from the change of the protoxide into the peroxide of iron. It is likewise a more convenient process, when acting upon a silicate soluble in the hydrochloric acid, for on treating the solution of the two oxides, by means of the sulphurous acid, it is very difficult to separate the sulphate of baryta produced, from the gelatinous silica with which it is mixed.

Likewise there are certain minerals in which iron appears to be in the state, partly of protoxide and partly of peroxide, which are not soluble in hydrochloric acid, while they readily dissolve in nitromuriatic acid. We have, then, no direct means to determine the relative proportions of the two oxides. I allude in this remark to Wolfram. Vauquelin has analyzed a variety of this mineral, coming from the department of Haute-Vienne, and he supposes that the iron exists in it, one-half in the state of protoxide, the other half as peroxide, (*Treatise on Analysis by the Dry Way*, Vol. II., p. 264.) By using, instead of the nitromuriatic acid, the hodrochloric acid, and acting upon a mixture of this mineral and peroxide of manganese, in the manner which I have pointed out, we may easily ascertain the relative proportion of the two oxides.

Two atoms of the protoxide of iron, 2 $\dot{F}e$ = 878.40, absorb one atom of oxygen = 100 in passing to the state of peroxide $\underline{\ddot{F}e}$.

Thus a difference of 1458.09 in the weight of sulphate of baryta obtained, corresponds to 879.40 of protoxide of iron.

One of sulphate of baryta corresponds to 0.602 of protoxide of iron.

4. We may verify in a convenient manner the laws of composition of a great number of metallic salts, by comparing the total quantity of oxygen absorbed, with that which remains combined, as an electro-negative element in the solution. I will state, for example, an examination which I made

of a cubic galena with large faces, which did not contain any sensible quantity of foreign matter. The peroxide of manganese used did not contain any baryta. Examined by itself, it gave for one gramme, 2 gr. 35 of sulphate of baryta, corresponding to 0 gr. 16 of oxygen.

One gramme of galena, finely powdered, was mixed with three grammes of peroxide of manganese. This mixture was treated by hydrochloric acid, with proper precautions. The galena was completely dissolved without depositing any sulphur. The sulphate of baryta resulting from the reaction of an excess of chlorine upon a solution of sulphurous acid, mixed with hydrochlorate of baryta, weighed, after calcination, ... 3 gr. 19

The three grammes of peroxide of manganese, treated by itself, with hydrochloric acid, should yield sulphate of baryta, ... 7 gr. 05

The whole quantity of oxygen absorbed, corresponds, then, to sulphate of baryta, ... 3 gr. 86

And is, consequently, equivalent to . . . 0 gr. 265

On the other hand, by precipitating the solution of lead, by means of the hydrochlorate of baryta, I obtained, sulphate of baryta 0.97; that is to say, very nearly one-fourth of 3 gr. 86. This agreement allows us to conclude, independently of every theory of the composition of the acids and sulphur, that there is a simple agreement between the quantities of oxygen, which sulphur and sulphurous acid take in passing to the state of sulphurous acid; and on the other hand, that there exists equally a simple agreement between the quantity of oxygen absorbed by the sulphur, to pass to the state of sulphurous acid, and that which the lead requires to be changed into protoxide.

But as we possess the knowledge of the composition of the sulphate of baryta, and that of the acids of sulphur, we may say:

Sulphate of baryta, 0 gr. 97, contains sulphuric acid, 0 gr. 331 composed of sulphur, 0 gr. 132, and oxygen, 0 gr. 199.

Or the whole quantity of oxygen absorbed is 0 gr. 265.

That taken by the lead to pass to the state of protoxide, will then be 0.265 — 0.199 = 0.066, that is to say, exactly one-third of the quantity taken by the sulphurous acid in changing to sulphuric acid. We know, likewise, that on evaporating to dryness the solution of lead in muriatic acid, the neutral sulphate of lead is regenerated. This salt then contains three times more oxygen in the acid than there is in the base.

5. Finally, the examination of a metallic compound by means of the mode which I have pointed out, will always serve to verify an analysis, when we know the nature of the products which should result from different bodies submitted to the action of an aqua regia, formed from the peroxide of manganese and hydrochloric acid. Thus we know that sulphur is always found in the liquid as sulphuric acid, arsenic as arsenic acid, and iron as a peroxide, &c. The quantities of oxygen which each of the bodies should take in the reaction, ought to be equal to the number given in the analysis. The products of the arts produced by the treatment of metals extracted from their sulphurets, or arseniurets, often contain very variable combinations of the oxides with the sulphurets. The separation of the different elements of these bodies incompletely oxidized, present difficulties, and it is evident that the exact determination of the whole of the oxygen absorbed by the bodies in dissolving would afford a valuable datum in discussing the results obtained by analysis.

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ART. IX.—ON VINOUS FERMENTATION.

By M. Cagniard de Latour.

In the year 1799, the class of physical and mathematical science of the Institute proposed as the subject of a prize essay, the following question: What are the characters which distinguish, in animal and vegetable substances, the matters which excite fermentation from those which undergo this action. The prize was a medal of the value of a killogramme of gold, or little more than three thousand francs; this prize was renewed in 1800, but was withdrawn in 1802, in consequence of an unfortunate event which deprived the Institute of the funds out of which the expense of the prize was to be defrayed.

This question remained unanswered, although it may be considered as interesting at the present moment, as when the prize was proposed. Under the idea that the Institute had principally in view the most important fermentation, or that by which saccharine substances are converted into alcohol and carbonic acid, the vinous fermentation, I undertook a series of researches thereon, but by a different mode of proceeding than had yet been done,—that is to say, by studying the phenomena by the aid of the microscope.

It is known to chemists that when fresh yeast is mixed with a solution of sugar, and the mixture put into a vessel deprived of the access of air, and exposed to the temperature of about 80° F., in a short time the solution begins to ferment, and the process proceeds with greater or less rapidity according to the proportion of the yeast used; while under the same circumstances, the vinous fermentation does not take place but after a long time, when the solution does not contain yeast, and the saccharine solution is pure.

It is, therefore, proper to examine with the microscope, the matter which has the property of causing sugar to ferment; this examination, as will be seen by the letter which I had the honor to address to the Academy on the 27th of April, 1835,

has led me to perceive that the granules of which it is composed have a globular form, and to conclude that they are probably organized bodies.*

These bodies are in general simple, diaphanous, spherical or slightly oblong, and nearly colorless;—but with all the attention I have been able to bestow upon them I have not been able to perceive any motions which could be considered as external exertion of the will. On the other hand, the globules of the yeast, as I have frequently observed, may appear in a liquid where they could not be perceived previous to the vinous fermentation taking place. When bodies of a globular form, other than crystals, are produced in a mucous liquor and do not appear to be possessed of the power of locomotion, these bodies are commonly considered as vegetables.

We may then consider it as very probable that the globules of yeast are organized, and that they belong to the vegetable kingdom; these conjectures appear to be confirmed by several of the observations which will be noticed subsequently.

But these plants, if we can so call simple vesicles, are extremely small; for among the globules of different dimensions of which the yeast is composed, the diameter of those which appeared to have attained the final extent of their developement, does not commonly surpass the one-hundredth of a millimetre; besides they are for the most part below this size,

* It is now more than twenty-five years since, being engaged in researches upon the best means of obtaining alcohol by the fermentation of different grains, I had the curiosity to examine the fresh yeast by means of the microscope. The instrument which I then used was very imperfect; I at that time thought that yeast resembled very fine sand composed of crystalline grains, but it is now evident that this was an error.

The principal microscopical observations indicated in the present paper, were made with a microscope constructed by M. Georges Oberhauser. The powers which I commonly used were three or four hundred diameters. To measure the size of the globules, I introduced into the instrument a micrometer, constructed by M. Charles Chevalier; I will add that this optician placed at my disposal one of Amici's microscopes, by which, in some instances, I was enabled to examine the globules with higher magnifying powers.

so that a cubic millimetre of yeast probably contains at least a million of these globules.

Presuming that the globules of the yeast should have the power of reproduction, I made several experiments to determine this point. The first, which were attempted on a small scale, failed, but this was not the case with two others which I made, one upon about ten heteroclites of the must of porter, which the kindness of M. Leperdriel afforded me the means, and the other upon a smaller quantity of the same must.

The results to which these trials have led, are: 1, that the globules of ferment, in consequence of the disengagement of gas which they cause, are carried to the surface, and that many of these globules remain entangled in the abundant froth produced by the fermentation; in which froth they may be readily distinguished by the microscope, by means of the brilliancy by which they are characterized; and 2, that the globules during their action upon the must of beer diminish in size, and by this contraction throw out seed or reproductive bodies, since new globules are soon perceived in the must, but with a faint or less visible appearance, although sufficiently large. The globules, which were not before visible, possess this peculiarity; they appear to have the power of reproduction, by buds or prolongations of their proper tissue, and thus to form connected globules, sometimes two, three, or even a greater number united together; a fact which seems to confirm my supposition, that the globules of yeast are organized and belong to the vegetable kingdom.

Considering it as very remarkable, that the globules of ferment should be deprived of the power of regeneration by the extension of their tissue, while younger individuals retained this faculty, I inquired of M. Turpin, whether he knew of any other microscopic bodies composed of isolated globules possessing analogous properties; by his answer it appeared that my observation was new.

Having examined with attention specimens of porter every hour, immediately on being drawn, from the vat, I perceived

at the end of the first hour after the addition of the yeast that the must already contained double globules; that is to say, upon each another smaller globule could be seen; that a little later this latter appeared to be enlarged, so that in many instances the two globules were of the same size; finally, the fourth specimen did not exhibit any double globules. I may add, that for the purpose of ascertaining whether the globules were connected, or only simply approximate, with a small needle I struck the glass containing the globules under the microscope, so as to produce considerable disturbance among the globules, but without breaking their connections; it however appears that these bodies on becoming older naturally lose their union, since in the ferment of commerce they are in general simple, as I have already remarked. This final disunion can hardly be attributed to any other than a vital action, distinct, it appears to me, from the idea that the formation of the globules are the result of crystallization, or of the coagulation of albumen; besides that in the course of the different fermentations which I have produced with the ferment of beer, it has happened that I could distinguish on certain globules many granules, and sometimes a round or oval spot, either central or lateral, which might be considered as a cicatrix or umbilicus formed by the disunion.

I suppose that ferment is of a vegetable nature, although containing azote, principally from this, that the globules have not the power of spontaneous movement. To this view it may be objected that some animals are deprived of such movements, and it is allowable to presume that among microscopic animalcules analogous bodies may be found, and that the globules are of this nature. But it appears to be more likely that ferment is of a vegetable nature, when we consider, 1, that this substance by its action upon sugar loses its azote, as was long since discovered by M. Thenard (*Ann. de Chim.;*) and 2, that all vegetables in a rudimentary state yield ammonia by distillation; besides that the azoted matter may be entirely separated and the vegetable tissue left behind, (*Mem. de M. Payen, Recueil des Savans Etrangers,* 1834.)

I have followed attentively the changes occurring in the juice of the gooseberry after it had been filtered and enclosed in a flask. I perceived in the liquid a few days after, many animalcules of some size, but which, although at first very active, became sluggish as soon as the vinous fermentation began, and soon disappeared, which is remote from the idea that the globules of ferment belong to the animal kingdom.

The globules of ferment are susceptible of the power of rapid development, for a little of the must from the vat of which I have spoken, on examination by the microscope eight hours after the addition of the yeast, already exhibited in the field of the instrument, armed with the power of three hundred diameters, from twenty-four to one hundred globules, while immediately after the introduction of the yeast there were but sixteen.

Likewise, on collecting the whole amount of the ferment which the vat of liquor could produce by the fermentation, the quantity was found to be very near seven times the weight of the ferment used; a fact which agrees very well with the results of my microscopic examination.

From the quickness with which the excess of the ferment was obtained, there is every reason to believe that this excess is due principally to the reproduction of the globules of ferment. Every brewer knows that the must of beer produces a greater weight of ferment than had been used, but this is supposed to be owing principally to the precipitation of vegetable albumen.

But while the must of beer is the means by which the globules of ferment may be very easily reproduced, it is not the same with simple solutions of sugar, for the ferment in acting upon these does not increase in weight, but on the contrary is well known to lose its activity.

To ascertain the cause of this deterioration, I examined with the microscope a ferment with which I had effected two successive fermentations of sugar in close vessels, and I perceived that the ferment which had but moderate powers contained a certain quantity of amorphous deposit, proceeding without

doubt from disorganized globules, and that the globules whose form could yet be distinguished, appeared somewhat dull and altered in shape. It appears, then, that if the ferment, after it has acted upon the sugar, is less active, although it has lost but little weight, it is because it contains fewer whole or living globules, from which it would seem probable that it is by some effect of their vegetation that the globules destroy the equilibrium of the constituents of the sugar, and thus gradually produce alcohol and carbonic acid; in addition to which it appears, that the globules are such as do not perish by being deprived of water, as ferment dried in the air does not for a long time lose its power of producing a good fermentation.

M. Gay Lussac, in an extract of his paper on fermentation, remarks on the subject of vinous fermentation, that it appears as yet to be one of the most mysterious operations of chemistry, the more especially as it will only act in succession, (*Ann. de Chim.*, 1810.) We may judge how just this reflection was, if, in consequence of my researches, we are led to conclude that vinous fermentation is the effect of the phenomena of vegetation.

This philosopher, also, has demonstrated that oxygen exercised a great influence upon the development of fermentation in certain liquids, especially the juice of the grape, but if this oxygen is necessary to its commencement, it is not to its continuance. From this discovery and other considerations, among which was, that that ferment of beer will produce fermentation in saccharine matters without the influence of oxygen, M. Gay Lussac gave the opinion that ferment may exist in a solid state in a great number of substances, but in a peculiar state differing from that of the ferment of beer.

With the view of having some knowledge of the nature of this difference, I made the following trial, the results of which, as we shall see, appear to demonstrate that the above opinion is well founded.

Thus, I kept, according to his process, for five days over mercury, the juice of the grape, which I had expressed for

this purpose, in a vessel filled with hydrogen gas. At the end of this time I examined by the microscope a portion of the deposit which the juice had thrown down, and found it almost amorphous—but upon making a similar examination, after by the introduction of oxygen into the vessel the vinous fermentation had been excited, I found in the deposit many globules. We would then be tempted to suspect—1, that the germs of these little vegetables form part of the matter of the sediment; 2, that there is no germination while they are enclosed in the grape; and 3, that this germination takes place when they are exposed to the action of oxygen gas, and it is by the commencement of their development that they become capable of acting like the yeast of beer.

On this occasion I remembered that M. Thenard, on filtering the juice of the gooseberry which he expressed from the fruit through a fine tissue, had collected on his filter a matter which contained very nearly the sixth of its weight of ferment, although it had been subjected to many washings before it was tried upon a solution of sugar; thus from this result, and those of my observations with the microscope upon ferments, there is no room to doubt, that the globules observed in the deposit from the juice of the grape, if not wholly, are in part formed with the elements contained in the matter of the deposit.

After what I have stated of the reproduction of the globules of ferment in the must of porter, it seems hardly to admit of doubt; nevertheless a learned physician has objected that, according to M. Milne Edwards, we can, by heating to a suitable degree the white of egg diluted with water, cause in this solution the appearance of globules, which did not before exist. It would then be allowable, he added, to suppose that ferment is an azotized matter formed by the coagulation of some vegeto-animal matter contained in the must of beer, and consequently that the globules obtained have no more vital organization than those obtained by the aid of white of egg and the action of heat.

To elucidate this subject, I placed on a sand bath, heated to

about 195° F., a capsule containing a mixture of 50 grammes of water, and one gramme of white of egg; as soon as part of the albumen was coagulated by the heat, I took away the capsule, and after it had cooled, I examined with the microscope a portion of the very thin pellicle which had formed on the surface of the liquid; I found that the pellicle did in fact contain a species of globules, of which the diameter might be about the hundredth of a millimetre; but they had in general something of a crystallized appearance, and on none of them could be distinguished either granules or umbilical spots. It appears to me, then, that the objection of which I have spoken is not sufficient to authorize the idea that the globules of ferment are analogous to those of the coagulated white of egg.

Likewise, I caused, in a closed vessel, the spontaneous fermentation of the must of porter; that is to say, without the addition of yeast. As would be expected according to the experiments of M. Thenard, this must, although it had been filtered, produced, by the vinous fermentation, a deposit of ferment; on examining with the microscope this deposit, I found it to be composed of globules analogous to those of common ferment. But this fermentation having proceeded more slowly than with the brewers, on the hypothesis that these globules are formed by a sort of albuminous coagulation, some ought to be very large, or at least slightly crystalline, like the globules of the white of egg, but this was not so; likewise it was observed that these globules were not generally as large as in common ferments, which is favorable to the supposition of an organization; for we may conceive that in a ferment by aid of a long time, the globules should be of very different ages.

I made the same experiment with a flask, previously filled with carbonic acid; the fermentation was developed a little more slowly, but otherwise the deposit obtained possessed the same microscopic appearances.

We know from Thenard, that juice of ripe fruits, and in general the liquors which undergo the vinous fermentation, throw down a deposit which has the same properties as ferment, (*Ann. de Chim.*) It is also known that a solution of

sugar with which the white of egg has been mixed, can, by a temperature of 95° F., sustained for some time, undergo the vinous fermentation and produce a deposit of yeast.

From these analogies, I supposed that similar deposits should afford under the microscope the same traces of organization as those of the ferment of beer; I consequently effected different fermentations in close vessels, especially on the juice of the gooseberry, of the grape, of the plum, as well as in a solution of sugar and white of egg, these liquids having been filtered previous to being introduced into their respective vessels; and on examining by the microscope the deposit obtained, I perceived that each of the deposits was composed in a large part * of globules analogous to the globules of the yeast of beer, results which agree in a remarkable manner with the observations of M. Thenard.

All those who are engaged in large fermentations, especially brewers and distillers of spirits from grain, know that in spite of all the care with which they carry on their operations, the results are extremely variable; these irregularities are also favorable to the hypothesis that the vinous fermentation is excited by bodies endowed with life, for we do not know in how many different manners such bodies may be affected.

We know from M. Thillorier, that the carbonic acid may become concrete by a certain degree of cold, and that in this state its temperature is inferior to that of frozen mercury. This skilful and ingenious experimenter had the kindness to place at my disposal some of the solid acid, which I mixed with the dry ferment reduced to fine powder. This ferment although it was thus exposed to a temperature excessively low,—that is to say, to 60° cent., and perhaps more, below zero,—was not the less fitted for the subsequent decomposition of sugar in as active a manner as before it was subjected to this cold.

* Independent of these globules, we can distinguish in certain deposits some other bodies; as, for example, crystals in the deposit furnished by grape juice, and shapeless flocculi in that produced by the experiment with albumen.

Since then I have frozen by a cold of 5° cent., fresh yeast mixed with a certain quantity of water, and afterwards ascertained that it could act upon saccharine solution like ordinary fresh yeast.

In conclusion, I may observe, that I have examined the principal works which treat of the vinous fermentation, in no one of which has it been proposed to employ the microscope to study the phenomena upon which it depends.*

This essay, as we may judge from the researches which it exhibits, was useful, since it has furnished many new observations, and from which it principally results—1, that the ferment of beer, a ferment of which so much use is made, and which for this reason it is proper to examine more particularly, is a collection of small globular bodies, susceptible of reproduction, consequently organized, and not a substance simply organic or chemical, as was supposed; 2, that these bodies appear to belong to the vegetable kingdom, and regenerate themselves in two different manners; and 3, that they appear to act upon a solution of sugar only while in a living state; from which we may conclude that it is very probably by some effects of their vegetation that they disengage carbonic acid from such solutions, and also convert them into spirituous liquors.

I may likewise remark, that ferment, considered as an organized matter, perhaps merits the attention of physiologists on these accounts—1, that it may be formed and develope itself under certain circumstances with great promptness, even in an atmosphere of carbonic acid, as in a brewer's vat; 2, that the mode of its regeneration presents peculiarities which have not yet been observed with regard to

* Leuwenhoek, in 1680, had already observed by the aid of the microscope that the yeast of beer contained globules, which he attributed to the farina employed for the formation of the must; but this observation, of which I had no knowledge previous to the presentation of my Memoir to the Academy, did not lead the author to the most important point, that these globules are capable of germinating and vegetating in the must of beer during its fermentation.

other microscopic productions of isolated globules; and 3, that it is not destroyed by a very considerable degree of cold or by being deprived of water.

Finally, I may consider that the question formerly proposed by the Institute, appears to be resolved by the results given, for they lead to the conclusion that generally the ferments, and especially those which produce the vinous fermentation, are composed of very simple, organized, microscopic bodies, and that the substances subjected to their action are purely chemical, such as sugar and analogous compounds.

Ann. de Chim. et de Phys.

ART. X.—OBSERVATIONS UPON BLAUD'S PILLS.

By M. Guibourt.

The following observations have originated from reading several articles published in the *Journal de Pharmacie du Medi*, and it appears to me, that as pharmaciens so little concur in the preparation and composition of Blaud's pills, it will not be useless to call their attention to this medicine, the base of which is a substance much employed in modern therapeutics.

The following is the formula of Dr. Blaud, as reported in the *Bulletin de l'Academie Royale de Medicine*, tom. 1, p. 92.

℞.—Sulphate of iron,
Subcarbonate of potassa, aa ʒiv.

Reduce the two substances separately to a very fine powder; mix them intimately, and add

Mucilage of gum tragacanth, q. s.

Beat well together, and form a mass, which divide into forty-eight pills.

In order to avoid any doubt, let us, in the first instance, notice the materials.

Sulphate of Iron.—Evidently it is meant the *green vitriol* of the older chemists. It is necessary to choose it in handsome crystals, transparent, of a pale or emerald green color, free from copper, and completely at the minimum of oxidation. Its formula is $\ddot{S}\dot{F}e+6OH_2$, and its atomic equivalent $=1615.24$.

Subcarbonate of Potassa.—This is the neutral carbonate of chemists, ($\ddot{C}\dot{K}$,) its atomic weight is 866.35. But this salt is found in the shops in several states, and it is important to fix upon that which should be employed. In one of these states it is very impure, forming the potash of commerce; and although the new Codex authorizes its employment, in the place of the true carbonate of potassa, containing, as it does, chloride of potassium and sulphate of potassa, still it cannot be imagined that this saline compound should be used in preparing Blaud's pills. Let us look a little farther for the article. There is found in the shops what is called *Salt of Tartar*, obtained by calcining cremor tartar, and lixiviating the product. This salt when dried presents the pure carbonate of potassa, and is such as is required in the formation of the pills; but what is at present found in commerce under the name of salt of tartar, is nothing more than impure potash dissolved in water and dried. A similar article which I examined was composed of

Carbonate of potassa	38.8
Chloride of potassium Sulphate of potassa	49.2
Water	12.0
	100.0

This certainly is not fit for the purpose.

It is easy for pharmaciens to obtain a carbonate of potassa almost pure, by following the method given in the *Pharmacopée Raisonnée*, tom. 2, p. 406. The best potash is to be dissolved in three-fourths or half its weight of distilled water. After twenty-four hours, it is filtered through double paper,

the solution is evaporated to dryness and the carbonate is then heated to redness. This salt is appreciably pure, and should be employed in all pharmaceutic operations, into which the carbonate of potassa enters in fixed and determinate quantity. We should state, however, that when this salt is kept for a long time, although in close vessels, it absorbs water, of which from 13 to 15 centièmes are taken up before it appears to be moist. This water produces no change in the the pills of Blaud, on account of the excess of alkaline carbonate still remaining, but if the same quantity of carbonate be always employed, it is better to take that which has been recently calcined. These preliminaries established, let us proceed to the preparation of the pills.

It is useless to reduce the two salts separately to fine powder, and to mix them by little and little as directed by Dr. Blaud. They can be triturated together in an iron mortar, but they rapidly become moist, and even liquefy, in consequence of the solution of the carbonate of potassa in the water of crystallization of the sulphate of iron. It is necessary only to triturate them until the white particles are no longer seen upon the pestle, after which there are several methods of finishing the pills. First, this may be done without any addition; the trituration is continued for some time and the mass liquefies; then it thickens, and appears ready to solidify, when it should be quickly taken out of the mortar and divided into pills, which is easily accomplished if there be no delay in the operation; if there be, the mass can neither be divided or rolled. To remedy this inconvenience, it is again rubbed in the mortar with a few drops of water; it then resumes the proper consistence, and retains it a sufficient length of time to perform the manipulations.

The pills thus prepared, often exhibit a peculiar phenomenon depending upon the second effect of the carbonate of potassa upon the sulphate of iron, (the first is to abstract the water of crystallization of the sulphate,) which is due to the formation of a sulphate of potassa and a carbonate of the protoxide

of iron. The latter is suroxidated by the atmosphere, loses its carbonic acid, and passes to the state of the hydrated peroxide. Now, in the pills prepared without addition, there is no mucilage to resist the action of the air and prevent the disengagement of carbonic acid; and both effects speedily take place. The pills become red on the succeeding day, swell and become powdery by handling. This state may still be remedied by rubbing the mass anew in a mortar, either alone or with a few drops of water, and re-forming the pills, which then are preserved in the air without any apparent new alteration.

If, instead of making the pills without addition, it is desired to render them cohesive by means of gum tragacanth, the moment is seized when the mixture of the two salts appears to be complete, and half a drachm of pulverized gum tragacanth is added; if the mass be withdrawn when it begins to thicken, it hardens so rapidly that it is impossible to finish the pills before they become friable. It is better, therefore, to allow it to harden in the mortar, and to give to it the requisite soft consistence with a little water, which is retained sufficiently long to make it into pills.

If, instead of gum tragacanth, a drachm of gum arabic be employed, the mass assumes a good consistence, and may easily be rolled. But however favorable circumstances may be for the manipulation, it is rarely that it can be terminated as it is begun: the last made pills become dry and friable, and if a little water be added, the mass assumes an elastic mucilagenous consistence which opposes the formation of pills.

By employing amidon instead of gum tragacanth, the mass instantaneously hardens, becomes friable, and cannot be moulded between the fingers.

Powdered marsh mallows would be well calculated to give consistence to Blaud's pills, if it did not give rise to a particular inconvenience arising from the nature of the substance. The mass remains soft and cohesive sufficiently long to divide into pills; but they exhale an ammoniacal and very disagreeable odor, produced by the reaction between the carbonate of

potassa and the *altheine* of the marsh mallows. This renders it objectionable.

To recapitulate. The best mode of making Blaud's pills consists in pulverizing the two salts together in an iron mortar, beating them until they shall be completely divided and mixed, adding to them half a drachm of gum tragacanth, and allowing the mass to solidify. Then the necessary quantity of water is added to give to it the suitable consistence to be divided into pills. But we may remark, that the pills as directed by Dr. Blaud, weigh more than 12 grains, and that their size is an objection to their administration. I think that they ought to be reduced to half the volume, that is to say, make 96 instead of 48. Two may then be taken in place of one.

M. Soubeiran, in his *Traité de Pharmacie*, has modified Blaud's formula in the way I have proposed, but I do not understand the object of assuming the number directed. His formula is: one ounce and seven drachms, or fifteen drachms of each of the salts, and a drachm of gum arabic, divided into 298 pills. According to Dr. Blaud, this mass should furnish 180 pills; in my opinion 360; the medium number will be 270. I cannot see the reason for adopting so irregular a number as 298.

I shall make another charge against M. Soubeiran; it is of having stated that Blaud's pills contain an excess of sulphate of iron which is not decomposed by trituration, and of having supposed, as a consequence, that there was formed a double sulphate of potassa and peroxide of iron. There can be no doubt as regards the carbonate of potassa employed, as M. Soubeiran directs the *dry* salt.

Now, as I have previously shown, the atomic weights of the crystallized sulphate of iron, and dry carbonate of potassa, being respectively 1615 and 866, it follows that 866 parts of the last are sufficient to decompose completely 1615 of the other, and that when equal parts are employed, there remains almost half of the carbonate in excess. To be more exact: of the four drachms of carbonate in the formula of Dr. Blaud,

there remains 133 grains, or 2.8 grains per pill, if there be made 48 of them, and 1.4 grains if the mass be divided into 96 parts, as I have proposed.

It is, moreover, easy to be convinced that a large excess of carbonate of potassa exists by dissolving a few of the pills, and filtering the liquid. This offers an alkaline reaction, and effervesces briskly with the acids. It is entirely colorless, and does not retain in solution an atom of iron, the metal being found in the precipitate in the state of carbonate or hydrated oxide. So that the following is the true composition of Blaud's pills.

They contain,—

Sulphate of potassa,
Carbonate of potasssa,
Hydrated carbonate of iron, more or less suroxidated and decomposed.

The use of these pills differs from that of the *hydrate of iron*, prescribed by physicians generally, under the name of *subcarbonate of iron*, not only in consequence of the presence of sulphate of potassa, as is supposed by some persons, but also of carbonate of potassa; and because the iron is preserved for a long time in the pills in a lower state of oxidation, and partly in the state of a carbonate, which, in fact, renders it more readily absorbed.

Since this medicine has been employed, many practitioners have substituted in their prescriptions the bicarbonate of potassa, for the simple carbonate; and I have not hesitated to direct this formula in my *Pharmacopée Raisonnée*, tom 1, p. 383, because, in fact, it presents greater advantages than the other.

1. By the avoidance of a very alkaline salt, an excess of which may not prove beneficial to the stomach.

2. By the formation of a double carbonate of potassa and iron, which is, of all the compounds of iron, the most fitted for absorption by the economy, for it is not only soluble, but not astringent.

The following is the formula, which is of convenient execution:—

Pills of carbonate of iron and potassa.

℞.—Pure crystallized sulphate of iron,
Crystallized bicarbonate of potassa, aa ʒiv.
Powdered gum arabic, ʒi.
Powdered marsh mallows, ʒss.

M.—Divide into 96 pills.

The two salts are triturated together in an iron mortar. They at first are rendered slightly moist, but soon after become dry. If the gum arabic be then added, the mixture is liquefied, which effect is due to the attraction of the gum arabic for the water of crystallization of the two salts, it forms a liquid solution, in which the salts are held. The marsh mallows produces the same result, but in a less marked manner; its addition is with the design of giving greater consistence to the mass. In this case, it is not subject to the same objection as in the former, where the carbonate of potassa decomposes the altheine of the marsh mallows. Here no such effect ensues, for no ammoniacal odor is disengaged. The mass becomes homogeneous and cohesive, preserving its softness a sufficient length of time for its division into 96 pills, and the dessiccation of the undivided mass, moreover, can be prevented by covering it with a cup, the interior of which has been moistened. These pills contain a slight excess of bicarbonate of potassa, (about half a grain per pill,) which constitutes with a corresponding proportion of carbonate of iron, a double salt soluble in water. The remainder is composed as in Blaud's pills, of subcarbonate, or hydrate of iron, and sulphate of potassa.

L'Experience.

ART. XI.—PRODUCTS RESULTING FROM THE ACTION OF NITRIC ACID UPON AMIDINE. By M. Pelouze.

M. Braconnot, some years since, made known an action of concentrated nitric acid, by which many substances, especially amidine and lignin, are converted into a new matter, which he denominated xyloïdine; but the composition of this substance, and the circumstances accompanying its formation, were not examined. The present paper has for its object the elucidation, in part, of these points.

If nitric acid, of the specific gravity of 1.5, be mixed with, or poured upon amidine, this latter disappears completely in the course of a few minutes; the solution, treated with water, lets fall the whole xyloïdine, and after filtration and evaporation, leaves scarcely any residue.

If, instead of producing the precipitate by means of water, immediately after the amidine is dissolved, the liquid is set aside in a closed vessel, it becomes gradually colored, and assumes the various tints of a mixture of nitric acid and deutoxide of nitrogen. Water forms with it a precipitate, which diminishes with the increase of time; at the end of two days, and sometimes even in a few hours, the liquid ceases entirely to become even cloudy; the xyloïdine has been destroyed, and converted completely into a new acid, which, by evaporation, is presented under the form of a solid, white mass, uncrystallizable and deliquescent, and of which the weight is much greater than that of the amidine submitted to the experiment. Moreover, neither carbonic or oxalic acid is produced during this reaction.

The xyloïdine, the first product of the action of nitric acid upon amidine, is the result of the union of the two substances. It is common amidine in which one atom of water is replaced by one atom of nitric acid. The whole amidine is changed into this substance, which perfectly explains the considerable augmentation of weight observed when the xyloïdine is precipitated by water immediately after the amidine has disap-

peared in the nitric acid. Since an excess of this acid converts the xyloïdine into a very soluble matter, which is nothing else than the new acid indicated above; this, likewise explains the different result obtained by M. Bracconot, who procured a weight of xyloïdine equal to the weight of the amidine employed. This is evidently owing to the fact that part of the former substance had been already decomposed. By delaying still more the precipitation, he would soon have been convinced of the impossibility of obtaining the slightest trace of xyloïdine.

When, instead of setting aside at ordinary temperatures, the mixture of amidine and concentrated nitric acid, the mixture is caused to boil, the amidine is decomposed in a few minutes, and converted into a deliquescent acid, which may be easily obtained pure, and in large quantity, by evaporation on a salt water bath. This acid does not contain azote; it has some resemblance to oxalhydric acid, but differs in its composition. A moderate heat converts it into another acid of a black color, soluble in water, and capable of reproducing, under the action of nitric acid, the white acid from which it is derived.

Boiling concentrated nitric acid attacks it with great difficulty. In the cold, it changes it slowly into oxalic acid, without any production of carbonic acid. Thus, by slow oxidation, determined by the presence of a suitable quantity of concentrated nitric acid, the amidine is changed successively into xyloïdine, a deliquescent acid, and into oxalic acid, without the carbon participating in the displacement of the other elements of these matters. These curious reactions take place of themselves in closed vessels.

We have said that the xyloïdine results from the combination of amidine with the elements of nitric acid. It is a salt in which amidine fulfils in relation to the nitric acid the part of a base; thus, it is very combustible at the temperature of 180° c. It takes fire, consumes without residue, and with much quickness. This property has led to an experiment which may be susceptible of some applications, especially in

artillery. On plunging paper in nitric acid of the specific gravity of 1.5, leaving it there sufficiently long to become saturated, in general two or there minutes, taking it out and washing in a large quantity of water, a kind of paper is obtained impermeable to moisture, and of extreme combustibility. The same takes place in fabrics of linen and cotton.

Jour. de Chim. Med.

ART. XII.—NECROLOGICAL NOTICE OF M. DULONG.

By A. F. Boutron-Chalard.

Science has sustained a loss by the decease of a man the most remarkable for the extent of his knowledge, his extreme modesty, and the brilliant qualities of his heart. M. Dulong, born at Rouen, the 12th of February, 1785, died, after a long illness, the 19th of July last. Devoted to science from his youth, at the age of sixteen years he entered the Polytechnic school; afterwards he studied medicine, and practised in Paris for some time, but finally abandoned the profession to devote himself to a series of labors, which attest the great profundity of his views, and the capacity of his mind. In 1811, when scarcely twenty-six years of age, he engaged in that series of experiments upon the chloride of nitrogen, during which he had the misfortune to loose an eye and three fingers; experiments which he recommenced as soon as recovery took place, and previous to making known this dangerous compound to the scientific world.

The researches which M. Dulong has published upon the mutual decomposition of soluble and insoluble salts; his excellent paper upon the combinations of phosphorus and oxygen; his observations upon some of the combinations of oxygen and nitrogen; those upon oxalic acid and the oxalates; the labor which he performed with Berzelius in 1819, at the time of the journey of the latter to Paris, which had for its

object the new determinations of the proportions of water and the density of some elastic fluids; finally, that in conjunction with M. Thenard, relative to the property which certain metals possess to facilitate the union of certain gases, which had for its aim the verifications of the excellent experiments of Dœbereiner upon the inflammation of hydrogen by platinum sponge, will always deserve the esteem and remembrance of chemists.

The students of physical science have, perhaps, even more obligations to him, for the excellent researches which he undertook, along with M. Petit, upon the laws of the dilatation of solids, liquids, and elastic fluids, and upon the exact measure of temperature; as well as for those upon the specific heat of bodies, which have rendered it certain that the atoms of simple bodies have always an equal specific heat, whatsoever may be their chemical nature, and which have determined that this equality is so exact, that by determining the specific heat of one body, we may from thence determine, numerically, the specific heats of all other simple bodies, as well as their chemical combinations, by means of their atomic weight. An ingenious and fruitful idea, which has caused great progress in the study of the atomic theory.

Finally, that excellent work which he undertook, together with M. Arago, in 1829, upon the relation between the temperature and pressure of vapor in boilers, will always remain as a model of precision and exactness in science.

A man endowed with such great sagacity, and such solid attainments, could not long remain unknown to the learned of Europe.

In 1815, when thirty years of age, he was the competitor of M. Girard for the vacancy in the section of general physic, caused by the death of M. Levêque, but was foiled in the contest! In 1823, when Fourier was named perpetual secretary, in the place of M. Delambre, M. Dulong was nominated his successor, and has since preserved in the Academy that influence which unpretending knowledge and a benevolent character always gives. Successively, professor in the school of Alfort,

adjunct to M. Thenard in the Faculty of Sciences, then professor of Physics. He was nominated director of the studies of the Polytechnic school, when the revolution of 1830 took place, and we may add, that the situation was never more worthily filled. Affable, kind, indulgent, though firm, to the students, they became accustomed to regard him as a father, and he, in return, loved them as his children. In 1832, when Cuvier was elected to the Academy of Sciences, of which he was one of the brightest ornaments, M. Dulong, by the spontaneous, and almost unanimous voice of his colleagues, was called to succeed him as perpetual secretary of the physical sciences; but his numerous duties, and delicate health, did not long permit him to retain these honorable stations. Simple in his tastes and habits, his life was passed in the bosom of his amiable family, and some devoted friends; and music, at intervals, was the only recreation which he allowed himself in the midst of his important labors. Disinterested, prodigal of his councils to young men, thoughtless of self, M. Dulong was the type of a true philosopher, and his death left the most profound regrets in the memory of all who knew him. In him the society and science lost, at the same time, a noble heart and fine talent.

Journal de Pharmacie.

ART. XIII.—PATENT MEDICINES. By C. Ellis.

There are few numbers of this Journal that have been more sought after, or that have contained matter more practically useful to a large number of its patrons, than that published in 1833, (No. I., Vol. V., p. 20,) containing the formulæ for Patent Medicines, as revised by a Committee of the Philadelphia College of Pharmacy, and adopted by that Institution in 1824.

There are many of the present subscribers who have not complete sets of the work, a large number, indeed, who were not subscribers to the old series, which has induced the belief that the republication of these recipes now, with the addition of a few others, might prove acceptable.

The Committee of the College of Pharmacy, to whom was intrusted the task of revision, found the greatest dissimilarity in the formulæ in use. They state in their report, that "in some of the recipes for the same medicine, there are not two articles alike, and the quantity of opium in Bateman's drops varies from one to nearly fourteen parts in a thousand parts of liquid."

"These variations have crept in, no doubt, partly through errors in transcribing the recipes, partly through imitations of the original medicine, made to answer the intention, and resemble it in taste and appearance, and partly through attempts at reformation, made from a conviction of the want of authenticity in the recipes in use."

The Committee further state, "that they have attempted a reform in these medicines, according to the following views:

"1st. To form a medicine possessing the chief compatible virtues ascribed to it in the usually accompanying directions.

"2d. To approach as near as is consistent with this design to the recipes in common use, rejecting inert and superfluous articles.

"3d. To make the strength of the medicine correspond with the doses ordered in the directions.

"4th. To direct in their composition articles which are easily procured genuine, and of a price such as not to hold out a temptation to alter or adulterate the medicine."

The attention of the Committee was confined to the first eight recipes which follow: that for Balsam of Honey not being among the number, was subsequently added to them by the New York College of Pharmacy, and was also published in this Journal, (Vol. VI., p. 61.)

1. *Hooper's Female Pills.*

These pills were originally designed, and are constantly used as cathartic and emmenagogue. The different recipes vary so much that aloes is the only article contained in them all. The committee have selected the Extract of Hellebore, the Sulphate of Iron and the Myrrh, as the best emmenagogues; Aloes as the cathartic basis, Ginger and Canella alba as aromatic correctives, and Soap as an adjuvant, and affording an eligible form. The fetid gums which are contained in many of the recipes are rejected as being antispasmodic rather than emmenagogue; the Extract of Savin as difficult to procure, and as necessarily injured in its preparation; the Ivory black as a clumsy and barbarous ingredient; and the remaining articles in the tables, as either inert or superfluous. The following recipe is submitted for the consideration of the trustees:

RECIPE.

Aloes Barbadensis,	℥viij.	400
Ferri Sulphatis Exsiccati,	℥ii. ℥iss.	
Vel Ferri Sulphatis crystal,	℥iv.	200
Extracti Hellebori Nigri,	℥ij.	100
Myrrhæ,	℥ij.	100
Saponis,	℥ij.	100
Canellæ in pulverem tritæ,	℥j.	50
Zingiberis in pulverem tritæ,	℥j.	50
		1000 parts.

Beat them well together into a mass with water, and divide into pills, each containing two and a half grains.

2. *Anderson's Scot's Pills.*

These pills are a mild aloetic purgative, with which, according to the judgment or fancy of the preparer, various adjuvants are combined. The formula submitted by the committee will, it is presumed, be liable to as few objections as any.

RECIPE.

Aloes Barbadensis,	℥xxiv.	787
Saponis,	℥iv.	131
Colocynthidis,	℥j.	33
Gambogiæ,	℥j.	33
Olei Anisi,	f.℥ss.	16
		1000 parts.

Let the aloes, colocynth and gamboge be reduced to a very fine powder, then beat them and the soap with water, into a mass, of a proper consistence to divide into pills, each containing three grains.

3. *Bateman's Pectoral Drops.*

More important errors have crept into this recipe than into any other. The quantity of Opium in one formula is 7½ grs. and in another 106 grs. to the pint. The Camphor varies still more. Castor is introduced into many of the recipes in place of Catechu, which appears to have been an original ingredient. and which it in no way resembles. The intention seems to have been to form a narcotic and astringent, possessed of diaphoretic and diuretic qualities. Such an intention will at least best answer the purposes for which the medicine is now used, and for which it is chiefly recommended in the printed directions. The formula submitted by the committee, contains half a drachm each, of opium, camphor and catechu in a pint, or about a grain of each in half a fluid ounce of the liquid. It contains an equal quantity of opium, with the elixir pare-

goric or opiated tincture of camphor of the American Pharmacopœia.

RECIPE.

Alcoholis diluti,	Cong. iv.	1000 parts.
Santali Rubri Rasi,	℥ij.	31.25
Digest for 24 hours, filter and add		
*Pulveris Opii,	℥ij.	31.25
Pulveris Catechu,	℥ij.	31.25
Camphoræ,	℥ij.	31.25
Olei Anisi,	f.℥iv.	7.81

Digest for ten days.†

4. *Godfrey's Cordial.*

The quantity of opium in this mild and much used narcotic varies in a very dangerous degree. Some of the recipes contain 4.46 parts, and others only .92 parts of opium in 1000 parts of the liquid. The printed directions state that a large tea-spoonful is the dose for a child one year old. Supposing the proper dose of opium for such a child to be the twelfth part of a grain, the quantity contained in 1000 parts of the liquid would be 1.39. As this is, however, much below the average quantity in the recipes, the committee have adopted the proportion of 2.08 to 1000; according to which a grain of opium is contained in an ounce, or two table-spoonsful of the liquid, which is the dose for an adult ordered in the printed directions. The salt of tartar, which is found to be very useful as an anti-acid, is retained in the proportion of one and two-thirds of a grain to the ounce; and the oil of sassafras is

*Vel tincturæ opii Oij et alcoholis diluti cong. iij Ovj.

† In the original preparation, the undissolved residuum was kept agitated in the mixture while bottling off, so as to form a sediment in each bottle. The virtues of the opium and catechu are entirely extracted by proof spirit, and the circumstance is merely mentioned that those who wish may preserve the appearance of the original. The coloring used for the artificial brandies may be substituted with advantage for the red saunders in the proportion of three ounces to the gallon.

adopted as being the carminative which has become one of the chief features in the medicine. The molasses should be that of the sugar refiners, and the composition should contain enough of it to resist fermentation.

The following formula, adopted with those views, is submitted:—

RECIPE.

Tincturæ Opii,	Oiss.	34.5	1000 parts,
Syrupi Nigri,	Oxvj.	367.8	
Alcoholis,	Oij.	46.	
Aquæ,	Oxxvj.	551.7	
Potassæ Carbonatis,	ʒiiss.		57.5
Olei Sassafras,	f. ʒiv.		11.5

Dissolve the salt of tartar in the water, add the molasses, and heat over a gentle fire till they simmer; take off the scum which rises, and add the laudanum and oil of sassafras, having previously mixed them well together.

5. *Dalby's Carminative.*

The printed directions for this mild carminative and laxative, order it in doses of a tea-spoonful for children, of from one to two years old, and of two table-spoonsful for an adult. These doses indicate the proportion of opium to be about a grain to the ounce, which the committee have accordingly adopted. The formula proposed by them contains also thirty-three grains of magnesia, and one and a half grains of salt of tartar to the ounce. This composition they think is well adapted to the doses, and for the diseases mentioned in the printed directions. The combination of essential oils which they have proposed, forms a milder and more grateful carminative than the same quantity of either taken alone. Several of the recipes contain the tincture of castor and assafœtida, which are no doubt occasionally useful, in the cases in which this medicine is prescribed. Both on account of their nauseous taste, and because the intention in this preparation seems to have been to form a carminative, rather than an antispasmodic,

we have omitted these tinctures. The following formula is proposed by the committee:—

RECIPE.

Aquæ,	Ox.	1000 parts.
Sacchari Albi,	℥xxxij.	200
Potassæ Carbonatis,	℥ss.	3.125
Magnesiæ Carbonatis,	℥xij.	75.
Tincturæ Opii,	f. ℥vi.	37.5
Olei Menthæ Piperitis,	f. ℈ij.	.5
Olei Carui,	f. ℈ij.	.5
Olei Anethi Fœniculi,	f. ℈ij.	.5

Triturate the essential oils with the sugar and magnesia, and then add the remainder.

6. *Turlington's Balsam of Life.*

The committee have taken, as the basis of their formula, the compound tincture of benzoin of the pharmacopœias, to which they have added balsam of Peru, myrrh, and angelica root. The following recipe affords, they think, an elegant and rich balsamic tincture:—

RECIPE.

Alcoholis,	Oviij.	1000 parts.
Benzoini,	℥xij.	93.75
Styracis Liquid,	℥iv.	31.25
Aloes Socotrinæ,	℥j.	7.8125
Balsam. Peruviani,	℥ij.	15.625
Myrrhæ,	℥j.	7.8125
Radicis Angelicæ,	℥ss.	3.90625
Balsam. Tolutani,	℥iv.	31.25
Extracti Glycyrrhizæ,	℥iv.	31.25

Digest for ten days, and strain.

7. *Steer's Opodeldoc.*

The committee have adopted, with slight variations, the linimentum saponis of the old London dispensatory. They

have added Aqua ammonia, which is contained in several of the recipes in the table, and is an excellent addition; and have substituted for the oil of Origanum the essential oil of the *Monarda punctata* a native plant nearly resembling it in odor, though more stimulating, and more readily to be procured genuine. In preparing this tincture, it is necessary to use soaps made with animal fats, if we wish the preparation to remain solid. The soaps made with vegetable oils, form solutions in alcohol that remain liquid at the common temperature.

RECIPE.

Alcoholis,	Oviij.	1000 parts.
Saponis Albi,	℥xx.	156.25
Aquæ Ammoniæ,	f. ℥iv.	31.25
Camphoræ,	℥viij.	62.5
Olei Rosmarini,	f. ℥j.	7.8125
Olei Monardæ,	f. ℥j.	7.8125

Dissolve the soap in the alcohol with a gentle heat, add the remaining articles, suffer the impurities to subside, and pour off into vials while warm.

8. *British Oil*

For the preparation of this patent medicine, there are in use two distinct classes of recipes, one having oil of turpentine and the other flaxseed oil or spermaceti oil as the basis. The character of the medicine as exhibited in the directions, and the uses to which it is now applied, would seem to require a preparation selected from both classes. With this view the following formula is adopted; omitting the *oil of bricks*, a nauseous and unskilful preparation, which has long been banished from the pharmacopœias, although contained in most of the recipes, and introducing Seneca oil in its place. As there appears to be no good reason for retaining it, the spermaceti oil is also rejected.

RECIPE.

Olei Terebinthinæ,	f. ℥viij.	326.05
Olei Lina Usitatissimi,	f. ℥viij.	326.05
Olei Succini,	f. ℥iv.	163.25
Olei Juniperis,	f. ℥iv.	20.46
Petrolei Barbadensis,	f. ℥iij.	122.47
Petrolei Amer. (Seneca oil,)	f. ℥j.	40.82
		1000.00 parts.

Mix them well together.

9. *Lee's Windham Antibilious Pills.*

RECIPE.

Pulv. Gum Gambogia,	℥iij.
" Aloes Socot.,	℥ij.
Sapon. Alb. Hispan.,	℥j.
Pulv. Potas. Nit.,	℥ss.
Extract Cow Parsnip,	℥j.

Mft. mass. sec. artem., cum. alcohol, q. s.
Divide into pills of five grains each.

10. *Lee's New London Antibilious Pills.*

RECIPE.

Pulv. Aloes Socot.,	℥xij.
" Scammon. Aleppo,	℥vj.
" Gambogia,	℥iv.
" Jalap,	℥iij.
" Calomel, ppt.,	℥v.
" Sapon. Castil.,	℥j.
Syrup of Buckthorn,	℥j.
Mucilag. Gum Arabic,	℥vij.

M. When well incorporated, divide ℥ij. of the mass into twenty-four pills.

☞ In this report the weights, measures, and preparations of the American Pharmacopœia are adopted as the standard.

MINUTES OF THE PHILADELPHIA COLLEGE OF PHARMACY.

Stated meeting held September 24th, 1838.

Present, twelve members. HENRY TROTH, Vice President, in the chair.

THOMAS P. JAMES was duly elected a resident member of the College.

The following communication, from EDWARD B. GARRIGUES, was read, and accepted.

"*To the President and Members of the Philadelphia College of Pharmacy.*

Having relinquished the Drug Business, with no prospect of again entering it, I have concluded to resign my right of membership in the College; you will therefore please accept this as my resignation, with my best wishes for your prosperity, collectively and individually.

I remain your friend,
EDWARD B. GARRIGUES."

A statement of the accounts of the late Treasurer, was also presented and approved. On motion,

Resolved, That the thanks of the College be presented to EDWARD B. GARRIGUES, late Treasurer of the Institution, for his long continued and faithful discharge of the duties of that office: and that the rules, requiring a surrender of the certificate of membership, be suspended in his case, and that he be requested to retain the same as a voluntary evidence on the part of this College, of the high sense they entertain of his exertions as an officer and member, to promote the interests of the Institution during his connection with it.

Resolved, That the Secretary be directed to communicate to him a copy of these resolutions.

Resignations of the right of membership in the Philadelphia College of Pharmacy, were read and accepted on the usual terms, from the following gentlemen, viz.: CHRISTOPHER MARSHALL and ISAAC THOMPSON.

This being the evening for the semi-annual election for Trustees, and there being a vacancy in the office of Treasurer, by the resignation of E. B. GARRIGUES, the following gentlemen were chosen:

Trustees.

PETER LEHMAN,	Dr. F. BACHE,
WM. W. MOORE,	JOHN WETHERILL,
JOHN C. LEHMAN,	CLEMENT CRESSON,
JACOB BIGONET,	WM. HODGSON, Jr.

Treasurer.

SAMUEL F. TROTH.

It was moved and seconded, that the names of WM. BAKER, and GEORGE GATCHELL, being largely in arrears to the College, and refusing to pay their subscriptions, and having neglected the attendance of its meetings for several years, be stricken from the roll of members.

Adopted *nem. con.*

March 25th, 1839.—Present, HENRY TROTH, PETER LEHMAN, CHARLES ELLIS, SAMUEL F. TROTH, DILLWYN PARRISH, RICHARD M. REEVE, WM. W. MOORE, HENRY W. WORTHINGTON, THOMAS P. JAMES, EDWIN A. HOSKINS.

HENRY TROTH, Vice President, in the chair.

The following gentlemen were duly elected resident members of the Philadelphia College of Pharmacy, viz.: Dr. ROBERT BRIDGES, RICHARD W. TEST, and JOHN GILBERT. HENRY W. WORTHINGTON, a graduate in Pharmacy, was also elected a resident member, at a meeting of the Board of Trustees.

The annual Report of the Publishing Committee of the American Journal of Pharmacy was read and adopted. They state that the work gives general satisfaction to its readers, and that its continuance, in their opinion, is essential to the best interests of Pharmacy in this country. That the Journal is prosperous in its financial condition, but if the gentlemen,

more generally, who are engaged in the drug business, were to subscribe with the same liberal feelings that a large number of them do, the work might be embellished and rendered still more useful and interesting than it is.

This being the evening for the annual election, the following Officers, Trustees, &c., were duly elected, viz.:

President.

DANIEL B. SMITH.

1st Vice President—HENRY TROTH.
2d Vice President—Dr. GEORGE B. WOOD.

Secretary—CHARLES ELLIS.

Corresponding Secretary—ELIAS DURAND.

Treasurer—SAMUEL F. TROTH.

Trustees.

WARDER MORRIS,	Dr. JOSEPH CARSON,
EDWARD ROBERTS,	THOMAS H. POWERS,
RICHARD PRICE,	DILLWYN PARRISH,
EDWARD C. MARSHALL,	RICHARD M. REEVE.

Publishing Committee.

DANIEL B. SMITH,	Dr. JOSEPH CARSON,
CHARLES ELLIS,	JOHN C. ALLEN,
Dr. GEORGE B. WOOD,	DILLWYN PARRISH,
Dr. FRANKLIN BACHE,	WILLIAM HODGSON, JR.,
Dr. ROBERT BRIDGES,	ELIAS DURAND.

Extracted from the minutes.

CHARLES ELLIS, *Secretary.*

At a commencement of the Philadelphia College of Pharmacy held at the Hall, April 23d, 1839, the degree of graduate of pharmacy was conferred on the following gentlemen:

Thomas W. Harris,	*Analysis of Mineral Waters,*
Robert B. Potts,	*Capsicum Annuum.*
Richard Rushton,	*Asarum Canadense.*
Henry W. Worthington,	*Veratrum Viride.*
Henry Brooks,	*Ipomea Jalapa.*
Claudius B. Linn,	*Aralia Nudicaulis.*
A. Dickenson Woodruff,	*Kino.*
Charles Willis Simons,	*Eupatorium Perfoliatum.*
William Edwin Knight,	*Chrysanthemum Parthenium.*
Thomas C. Hopkins,	*Delphinium Consolida.*
Walter Shinn,	*Convolvulus Panduratus.*
Thomas Haines,	*False Article of Drymis Winteri.*

An address was delivered by Dr. Carson, Professor of Materia Medica.

Charles Ellis, *Secretary.*

MINUTES OF THE NEW YORK COLLEGE OF PHARMACY.

At a meeting of the College, held March 21st, 1839, the following gentlemen were elected officers of the Institution for the ensuing year:

President.

CONSTANTINE ADAMSON.

1st Vice President—JOHN MILHAN.
2d Vice President—OLIVER HULL.
3d Vice President—JAMES H. HART.

Treasurer.

CHARLES L. WHITE.

Secretary.

WILLIAM H. MILNOR.

Trustees.

BERNARD SOUILLARD, GEORGE D. COGGESHALL,
JOHN CARLE, jr., MARCUS HURD,
DAVID T. LANMAN, JAMES CRUMBIE,
MARSHALL C. SLOCUM, BENJAMIN QUACKENBOSS,
JOHN MEAKIM.

At the same meeting the following gentlemen were elected honorary members:

Robert Christison, Professor Medical Jurisprudence, in the University of Edinburgh.
Daniel B. Smith, President of the Philadelphia College of Pharmacy.
Henry Perrine, M. D., Indian Key, Florida.
Laurens Hull, M. D., Allegheny County, New York.
Betheul Pecks, M. D., Warren " " "
Seth H. Pratt, M. D., Alleghany " " "
Salmon Axtell, M. D., Washington " " "
Waterman Ellsworth, M.D., Chatauque " " "
Andrew Sill, M. D., Livingston " " "

H. Mitchell, M. D.,	Chenango	county,	New	York,
A Leavenworth, M. D.,	Cataraugus	"	"	"
A. McIntyre, M. D.,	Warren	"	"	"
John Coats, M. D.,	Genesee	"	"	"

An Act to regulate the preparation and dispensing of medicines in the city of New York, passed March 11, 1839.

The people of the state of New York, represented in Senate and Assembly, do enact as follows:

SEC. 1.—No person shall be hereafter allowed to commence or practice, in the city of New York, the business of an apothecary, or that of preparing and dispensing medicine, or of preparing or putting up physicians' prescriptions, without having previously obtained the diploma of the College of Pharmacy of the city of New York, or unless furnished with a diploma from some other regularly constituted College of Pharmacy or Medicine, or shall have passed an examination of the censors of the medical society of one of the counties of this state, and have been furnished by such censors with a certificate of his qualifications for the business of an apothecary, which diploma or certificate he shall produce to the Secretary of the said College of Pharmacy to be by him registered without charge.

SEC. 2.—Any persons offending against the provisions of this law, shall be subject to a penalty of fifty-one dollars for each and every offence, which may be recovered with costs, in the name of the people of the state of New York, in any civil court of record, and the said fines when collected, after deducting such reasonable counsel fees as the court shall allow, shall be paid by the district attorney to the Treasurer of the New York City Dispensary for the use of said Dispensary.

SEC. 3.—This law shall not apply to persons who now are in said business, nor to the preparation and dispensing of medicines by licensed physicians.

MISCELLANY.

On the action of weak alkaline solutions upon some of the metals, by M. Vogel de Munich.—(Extract.) I may add some observations upon the manner in which the alkalies appear to affect the oxidation of copper.

Daily experience teaches us that diluted sulphuric acid has the property of hastening the oxidation of copper by means of the air. But here the acid plays an active part, for it combines with the oxide of copper, which is formed by means of the oxygen of the air.

We cannot arrange, in the same class, the simultaneous action of the alkalies and air upon copper, because the diluted solution of the alkalies employed, does not suffer any change, or combine with the oxide of copper formed.

The alkalies appear, then, to act in a passive manner; nevertheless, they tend to set in action, and promote the affinity which exists between the copper and the oxygen of the air.

For this reason, we may consider the phenomena as a catalytic effect, similar to that of spongy platinum upon hydrogen and oxygen, or to the action which gold has upon the deutoxide of hydrogen.

We have already, in chemistry, many examples of this kind, in which we may perceive an influence purely catalytic, or even a mixed catalytic influence; that is, catalysis accompanied by more or less of affinity.

CONCLUSIONS.

It results from the experiment related—

1. That iron and steel may be protected from rust, by weak alkaline solutions.

2. That bars of steel preserve their metallic lustre even when in contact with one another.

3. That the absence of air is not the cause why steel is preserved from oxidation.

4. That antimony and nikel do not lose their lustre in weak alkaline solutions.

5. That bismuth becomes of a brass-yellow, and afterwards of a purple color.

6. That zinc and cadmium becomes covered with yellowish-gray films.

7. That lead and tin are attacked; the lead becoming covered with its carbonate, and the tin with its deutoxide.

8. That copper is attacked still more promptly by weak alkaline solutions, than all other metals, and that the oxidation of copper is even accelerated by strong solutions.

9. That brass becomes black in alkaline solutions, while the alloys of copper and nickel preserve perfectly their metallic aspect.

10. That potassa and soda, dissolved in much water, appears to produce the oxidation of copper by a catalytic influence.

11. Finally, that copper is capable of being bronzed by alkaline solutions.—*Journ. de Pharmacie.*

Ipecacuanha deprived of its nauseous substance.—M. Gay has given the following method of depriving ipecacuanha of its nauseous odor and disagreeable taste, which are often so inconvenient as to prevent its prescription by practitioners.

Take of pure rectified sulphuric ether, 6 parts,
Finely powdered ipecacuanha, 1 part.

Mix the powder in the ether, allow it to macerate for several hours, and filter; wash the powder with a small quantity of pure ether, dry it, and when the powder has lost the ethereal smell, triturate, and preserve for use.

The dose of the powder, thus prepared, is the same as that of common ipecacuanha; in fact it has not lost any of its active principle.

Journ. de Chemie Med.

Syrup of Cod Liver.—In Switzerland and Germany, the oil of cod liver is recommended in gouty and rheumatic affections, obstinate constipation, incontinence of urine, scrofula, rachitis, &c. M. Caron Villard has directed the attention of practitioners to this oil, and M. Duclon, pharmacien, in order to render it of more ready administration, has converted it into a syrup, the formula of which he gives in the *Bulletin Général de Therapeutique.* The following is the formula:

Take of Oil of Cod Liver,	℥viij.
Gum Arabic, powdered,	℥v.
Water,	℥xij.
Syrup,	℥iv.
Sugar,	℥xxiv.

Make of the syrup, gum, oil, and water, an emulsion, in which dissolve the sugar with gentle heat; filter, and flavor with two ounces of orange flower water.

The dose administered depends upon that of the oil. It is three or four table-spoonsful a day for adults, and the same number of tea-spoons-

ful for children. Hitherto it has been combined with carbonate of potassa and a little volatile oil.

The oil has also been given by injection, and employed by means of friction in larger doses. *Ibid.*

Salicine in Intermittent Fever.—Dr. A. Fioris has employed salicine in one hundred and eight cases of intermittent fever, with the greatest success. The highest dose administered was twenty-four grains, and in every case, except two, the disease was immediately moderated by the remedy, and eventually cured.

Med. Yahrbücher, Vol. 24, p. 174, and *Lancet.*

Preparation of Jalap.—The powder of jalap may be easily deprived of the nauseous taste, which renders it so disagreeable, by the following process:

℞.—Powdered Jalap, one part.
Rectified Sulphuric Ether, three parts.

Macerate for twenty-four hours, and then carefully decant the fluid which has acquired a deep yellow color. Add a fresh proportion of ether to the powder, macerate again for twenty-four hours, and decant. The powder must now be allowed to dry on a sheet of paper, and, when perfectly dry, is to be triturated in a mortar. By this means may be obtained a powder which is completely deprived of odor, and still retains all its purgative properties. *Lancet.*

Poisoning by a drachm and a half of Extract of Belladonna.—M. L., aged 20, brother of an apothecary of Perigeux, had been taking, for several days, whey mixed with the juice of herbs. On the 27th of last August, towards 10 o'clock, P. M., he drank a glass of fluid, which he thought to be his usual dose, and went to bed. After half an hour's drowsiness, with extreme agitation, he was aroused from experiencing general uneasiness and extreme debility; in a short time he became delirious, with universal and continued agitation, and noisy loquacity. He thought he saw around him flying butterflies and insects of every kind; he scratched his skin, and rubbed his nose, and covered and uncovered himself constantly; his tongue became red and exceedingly dry; pulse 120; face injected; eyes red; pupils so dilated that their opening was lost in the circumference of the cornea; the delirium became furious; it required six persons to restrain him.

M. Parrot administered in succession three grains of tartar emetic without effect, until the last, which produced some vomiting. He then had recourse to a large bleeding, in consultation with M. Galos; free puking was thus induced instantaneously, and there was voided a liquid having the color of a solution of belladonna. This was at 2 o'clock, P. M.;

the delirium, so far from diminishing, appeared to augment; the pulse became small and contracted; the respiration stertorous; and the condition of the patient became very alarming. Another bleeding was practised during the night; improvement; water acidulated with vinegar administered as a drink; potion with ether; purgative enema; better.

Next day, continuance of loquacity and disorder of intellect; agitation; rubs his nose; pupils still much dilated; tongue red; abdomen painful; pulse frequent and hard. Fifteen leeches to the epigastrium; a warm bath; same drink. From this time there was progressive amelioration, and finally a cure.

This observation is analogous to another reported in 1815, in the Gazette Medicale: in that case the belladonna had been taken by injection, and in larger dose. The resulting phenomena were nearly the same in both cases. P.

Journ. de Chimie Med.

A new Pipette, by A. Levol.—I have used, for the purpose of washing filters, a pipette, which is very simple, and appears to have some advantages over those which are in common use, and which, for these reasons, I will describe. It is composed of a small and straight tube, drawn out at its upper extremity, the other being inserted in a flask which contains the water, as in the common manner; but I add a tube, curved in the form of a syphon, of which one of the branches is inserted into the flask to the bottom, and the other remains without. It is evident, then, that, on inverting the apparatus, the flow of the water will take place from atmospheric pressure, with greater or less rapidity, according to the height of the column of liquid; and this may be accelerated by blowing into the exterior branch of the syphon. This apparatus will also permit the use of hot water, as has been latterly recommended in the lessons at the School of Mines.—*Ann. de Chim. et de Phys.*

Bichromate of Perchloride of Chromium.—This remarkable compound was discovered by Berzelius; it was at first called perchloride of chromium, because when put into contact with water it was changed into chromic and hydrochloric acid. Its true composition was ascertained by M. Henrich Rose.

M. P. Walter gives the following process for preparing this compound: put into a tubulated glass retort an intimate and finely powdered mixture of 100 parts of fused common salt, and 168 parts of neutral chromate of potash; an S tube is to be put into the tubulure of the retort, through which there are gradually poured 300 parts of concentrated sulphuric acid. The action is rapid from the commencement; intense red vapors, accompanied by much chlorine, are disengaged. The receiver is to be kept cold to condense the vapor. The acid must be gradually added, or otherwise a

loss of the red vapor will take place, and besides this the contents of the retort rise and pass into the receiver. As soon as the acid is added, the retort is to be gently heated, and the heat is to be increased, until yellow vapors begin to arise; the operation is then finished. In the receiver there is found a liquid of an intense red color, and a solid substance, which, according to M. Dumas, is a compound of this substance with chlorine. By decantation they may be separated, and the liquor when rectified, so as not to obtain the whole of it, yields a compound, the boiling point of which is constant.

The liquid thus obtained is of a magnificent blood-red color; it is volatile, and yields fumes abundantly; when put into a quantity of water it falls to the bottom in drops of an oily appearance, and is converted into chromic and hydrochloric acids. Its boiling point is 244° Fahr., and its specific gravity is 1.71; it acts rapidly on mercury; it is decomposed by sulphur, detonates with phosphorus, dissolves chlorine and iodine, and combines with ammonia with the disengagement of light. A small quantity mixed with concentrated alcohol combines with it with violent explosion, and the inflamed alcohol is projected with force. This unexpected action had nearly deprived M. Walter of his eyesight, and burnt him horribly.

The analysis of this substance by M. Walter, agrees with that of M. Rose, namely,

Oxygen, ...	19.28
Chlorine, ...	45.14
Chromium, ...	35.58——100

Ann. de Chimie, et de Physique.

It appears to me that it would be more simple to consider this compound as an oxichloride of chromium, than a bichromate of perchloride of chromium. It might be regarded as composed of

Two equivs. of Oxygen, . .	16	or 20
One equiv. of Chlorine, . .	36	45
One equiv. of Chromium, . .	28	35
	—	—
	80	100

Lond. and Edin. Philos. Mag.

On the action of Fermentation on a mixture of Oxygen and Hydrogen Gases; by M. Theod. De Saussure.—It is well known that the quantity of hydrogen gas contained in the atmosphere does not amount to 1-1000th of its volume. Nevertheless the decomposition of organic matters continually adds fresh quantities of this gas to atmospheric air; on the other hand there are few substances which occasion the combination of hydrogen with oxygen at common temperatures; and the circumstances which the combination requires, prove that the disappearance of the hydrogen cannot be accounted for in this way. M. de Saussure states that

he has found that the combination is effeted by the fermentation of organic substances universally distributed over the surface of the soil, even when on account of the smallness of their quantity and the slowness of their operation no rise of temperature takes place.

By exposing fermentable bodies in pieces of the size of a nut to the mixed gases, M. de Saussure has arrived at the following conclusions:—The combination of hydrogen and oxygen gases may be effected without inflammation at the temperature of the air, by bodies submitted to slow fermentation.

They usually produce this combination when they are accumulated and impregnated with a sufficient quantity of water to prevent their complete contact with the oxygen gas. If this contact be made by increasing the surface of the fermentable body, or by diminishing the quantity of water, the hydrogen gas, is not absorbed, and the oxygen gas disappears in other combination.

The porosity of the fermenting body greatly contributes to the destruc- of the detonating mixture.

Many observations prove that the hydrogen gas which disappears by fermentation combines with the oxygen gas, in the proportion of the elements of water. The demonstration requires that the oxygen shall be employed only to form this water, and all the carbonic acid produced in the operation.

The fermentable substances mentioned in the memoir do not effect the combination of the oxygen and hydrogen gases before they ferment, nor when the fermentation is stopped by an antiseptic. Soils and humus, mixed with different earths, undergo a slow fermentation as soon as they are moistened, which gives them the power of destroying the mixture of oxygen and hydrogen gases.

Gaseous oxide of carbon, and carburetted hydrogen gas, obtained by decomposing water with red-hot iron, were not destroyed by fermentation when they were substituted for common hydrogen gas, in the explosive mixture formed of two volumes of hydrogen gas and one volume of oxygen gas. Azotic, hydrogen and oxygen gases, added to the explosive mixture, do not present any remarkable obstacle to the destruction of an explosive mixture by a fermenting body, nor to that which is effected under the same circumstances by a plate of platina recently cleaned.

Oxide of carbon, and olefiant gas and others, which prevent the combination of oxygen and hydrogen by platina, are also great obstacles to the same result of fermentation.

Nitrous oxide, added to the explosive mixture, was partly decomposed by fermentation, and did not prevent the combination of the hydrogen and oxygen gases.—*Bibl. Univ. Feb.* 1838. *Sup. to Lond. & Edin. Philos. Mag.*

Balsam of Peru.—M. Fremy, in a paper upon the balsams, has proven that there may be obtained from the liquid balsam of Peru, by very simple means, two substances, one liquid and the other crystalline. The liquid matter, which he has called *Cinnamine*, exhibits great analogy to the fatty bodies. When it is treated with a concentrated solution of potassa, it is changed into cinnamate of potassa and a neutral volatile substance, which he has called *Peruvine*. This reaction takes place without disengagement of gas, or absorption of oxygen.

When cinnamine is treated by hydrate of potassa in fragments, the cinnamate of potassa is again formed; but, in this case, pure hydrogen is disengaged, and there is no trace of Peruvine. The composition of cinnamine explains perfectly these reactions. The crystalline matter of balsam of Peru is, in composition, a hydrate of cinnamine, and has similar reactions. When treated by hydrate of potassa, it is changed into cinnimate of potassa, and pure hydrogen is disengaged.

These two bodies form the resin and cinnamic acid which is met with in balsams exposed to the air. The balsam of Tolu has exactly the same composition as the balsam of Peru; it also contains cinnamic acid, and a resin of the same composition as that of balsam of Peru.

Acad. des Sciences, Journ. de Chim. Medicale.

Falsification of Manna.—M. Boenoist, pharmacien at Saumar, states, that he received, a short time since, from a druggist of Paris, a quantity of manna in sorts, mixed with a substance which he recognised to be *sugar of amidon*. Having, without difficulty, separated a pound of this substance from twelve of manna, he was convinced that a pound of it still remained, which was so divided, and agglutinated with the fat manna, that it would have required a considerable expenditure of time to extract the whole of it.

Upon examining, attentively, this manna, the substance was perceived existing under the form of small, irregular pieces, sometimes isolated, and at others agglutinated with the manna. These fragments, which, in addition, never assume the form of tears, are, in general, harder, and have neither the taste or the crystalline form of manna. Their fracture is granulated and gritty to the knife, their surface is shining. Among these pieces it is impossible to find a single one which has the form of a tear; thus none present a convex and a concave side, the result of the solidification of the manna upon the branches of the trees which produce it.

The same falsification has been submitted to the Societié de Pharmacie, by M. Soubeiran, August, 1837. *Journ. de Pharmacie.*

Sophistication of Carmine.—M. C. C. Ehrenberg informs us, that he has found in commerce, under the form of troches, a very beautiful carmine, of high price, which, nevertheless, has undergone sophistication. When

employed for the ordinary purposes of painting, no difference can be detected between it and the purest carmine; by means of the microscope, it can be discovered that half of it is composed of wheat starch, which, intimately commingled with the minutely divided carmine, gives to it a brilliancy, and considerably increases the clearness of its color. When this article is diffused through a large quantity of water, it remains for a long time suspended, and finally produces a deposit, similar in appearance to white lead, but readily distinguished from it, simply by its specific weight, which is less. This sediment is nothing else than amidon, for it is rendered gelatinous by boiling water, and is colored blue by iodine.

It may be interesting to artists to know that some colors of this kind, mixed with organic substances, although generally pretty permanent, are, nevertheless, subject to decomposition in a humid atmosphere, and that amidon, in consequence of its transparency, covers a less surface than white lead. *Lon. Phil. Mag., and Journ. de Pharm.*

Action of Nitroxanthic Acid upon the solution of Opium, by M. MULLER.—Nitroxanthic acid, formed, as is known, by the action of nitric acid upon indigo, exhibits a characteristic reaction with the solution of opium. It instantaneously occasions, in these solutions, even when diluted, a canary-yellow precipitate, while the liquid becomes colored wine-red. The precipitate collected upon a filter, has a reddish-yellow color, and an extremely unctuous consistence; it is soluble in alcohol and many of the essential oils, and partly in ether, the acids, and alkalies.

This substance appears to be a combination of *bitter* of Welter, (carbazotic or picric acid,) with the balsam of opium, and it may be named myroxanthe, (yellow balsam,) or picroxanthe, (yellow bitter.)

The nitroxanthic acid, in consequence of this reaction, may serve as a re-agent for opium, because it produces a precipitate with solutions of opium, even the most dilute, and because the unctuous substance developes the characteristic odor of opium when heated, even when the quantity is very small. *Journ. de Pharm.*